



2022 Annual Report

April 26, 2023



**UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
WASHINGTON, D.C. 20549**

FORM 10-K

(Mark One)

☒ **ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

For the fiscal year ended December 31, 2022

☐ **TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**
or

For the transition period from _____ to _____

Commission file number: 001-32598



Entegris, Inc.

(Exact name of registrant as specified in its charter)

Delaware
(State or Other Jurisdiction of
Incorporation or Organization)

41-1941551
(I.R.S. Employer
Identification No.)

129 Concord Road, Billerica, Massachusetts 01821
(Address of principal executive offices and zip code)

(978) 436-6500
(Registrant's telephone number, including area code)

Securities registered pursuant to Section 12(b) of the Act:

Title of Each Class	Trading Symbol(s)	Name of Exchange on which Registered
Common Stock, \$0.01 Par Value	ENTG	The Nasdaq Global Select Market

Securities registered pursuant to Section 12(g) of the Act: None

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. ☒ Yes ☐ No

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or 15(d) of the Act. ☐ Yes ☒ No

Indicate by check mark whether the registrant: (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes ☒ No ☐

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T (§232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit such files). Yes ☒ No ☐

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, a smaller reporting company, or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company," and "emerging growth company" in Rule 12b-2 of the Exchange Act.

Large Accelerated Filer	<input checked="" type="checkbox"/>	Accelerated Filer	<input type="checkbox"/>
Non-Accelerated Filer	<input type="checkbox"/>	Smaller reporting company	<input type="checkbox"/>
		Emerging growth company	<input type="checkbox"/>

If an emerging growth company, indicate by check mark if registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act. ☐

Indicate by check mark whether the registrant has filed a report on and attestation to its management’s assessment of the effectiveness of its internal control over financial reporting under Section 404(b) of the Sarbanes-Oxley Act (15 U.S.C. 7262(b)) by the registered public accounting firm that prepared or issued its audit report. ☒

If securities are registered pursuant to Section 12(b) of the Act, indicate by check mark whether the financial statements of the registrant included in the filing reflect the correction of an error to previously issued financial statements. ☐

Indicate by check mark whether any of those error corrections are restatements that required a recovery analysis of incentive-based compensation received by any of the registrant’s executive officers during the relevant recovery period pursuant to § 240.10D-1(b). ☐

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Exchange Act). Yes ☐ No ☒

The aggregate market value of voting stock held by non-affiliates of the registrant, based on the last sale price of the Common Stock on July 2, 2022, the last business day of registrant’s most recently completed second fiscal quarter, was \$9,345,493,438. Shares held by each officer and director of the registrant and by each person who owned 10 percent or more of the outstanding Common Stock have been excluded from this computation in that such persons may be deemed to be affiliates of the registrant. The determination of affiliate status for this purpose is not necessarily a conclusive determination for other purposes.

As of February 13, 2023, 149,381,222 shares of the registrant’s Common Stock were outstanding.

DOCUMENTS INCORPORATED BY REFERENCE

Portions of the registrant’s Definitive Proxy Statement for its 2023 Annual Meeting of Stockholders scheduled to be held on April 26, 2023, or the 2023 Proxy Statement, which is scheduled to be filed with the Securities and Exchange Commission, or SEC, not later than 120 days after December 31, 2022, are incorporated by reference into Part III of this Annual Report on Form 10-K. With the exception of the portions of the 2023 Proxy Statement expressly incorporated into this Annual Report on Form 10-K by reference, such document shall not be deemed to constitute part of this Annual Report on Form 10-K.

Auditor Name	Auditor Location	Auditor Firm ID
KPMG LLP	Minneapolis, Minnesota	185

ENTEGRIS, INC.

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PART I

Item 1. Business.

OUR COMPANY

Entegris, Inc. (“Entegris”, “the Company”, “us”, “we”, or “our”) is a leading supplier of advanced materials and process solutions for the semiconductor and other high-technology industries. We help our customers maximize manufacturing yields, reduce manufacturing costs and enable higher device performance by leveraging our unique breadth of capabilities to provide mission critical enhanced materials and process solutions for the most advanced manufacturing environments.

Semiconductors, or integrated circuits, are key components in electronic devices that have changed, and that we believe will continue to change, the way we live, communicate and work. Products and emerging applications such as smartphones, 5G wireless technology, cloud computing, the Internet of Things, machine learning, artificial intelligence, high performance computing, smart transportation, smart healthcare, gaming and virtual reality will require faster, more powerful and more energy efficient semiconductors. We believe these new trends, combined with existing applications, will drive long-term secular growth for semiconductors. We expect that demand for semiconductors will reach \$1 trillion by 2030, which would create significant new opportunities for our products.

To meet requirements for improved chip performance and density, semiconductor manufacturing processes have rapidly become increasingly complex by moving to smaller geometries and adopting new device architectures. These complex processes are enabled by new and innovative materials; and higher materials purity, quality and stability are critical to improving and maximizing yields. We believe Entegris offers the industry’s most comprehensive electronic materials portfolio, operating squarely at the crossroads of material science and materials purity. These two core capabilities are quickly becoming critical enablers of our customers’ technology roadmaps. These trends are expected to translate to a higher served addressable market and expanding Entegris content per wafer and, by extension, growth above the market for Entegris.

Our business is organized and operated in four operating segments, which align with the key elements of the advanced semiconductor manufacturing ecosystem.

- The Specialty Chemicals and Engineered Materials segment, or SCEM, provides high-performance and high-purity process chemistries, gases and materials, and safe and efficient materials delivery systems to support semiconductor and other advanced manufacturing processes.
- The Advanced Planarization Solutions segment, or APS, provides complementary chemical mechanical planarization solutions, advanced materials and high-purity wet chemicals; including chemical mechanical planarization (“CMP”) slurries, pads, formulated cleans and other electronic chemicals.
- The Microcontamination Control segment, or MC, offers solutions to filter and purify critical liquid and gaseous chemistries used in semiconductor manufacturing processes and other high-technology industries.
- The Advanced Materials Handling segment, or AMH, develops solutions to monitor, protect, transport and deliver critical liquid chemistries, wafers and other substrates for a broad set of applications in the semiconductor industry, life sciences and other high-technology industries.

These segments share common business systems and processes, technology centers and technology roadmaps. With the complementary capabilities across these segments, we believe we are uniquely positioned to create new, co-optimized and increasingly integrated solutions for our customers. For example, after the acquisition of CMC Materials, Inc. (“CMC Materials”), we now offer an end-to-end offering for our customers consisting of advanced deposition materials from our SCEM segment, CMP slurries, pads and post-CMP cleaning chemistries from our APS segment, CMP slurry filters from our MC segment, and CMP slurry high-purity packaging and fluid monitoring systems from our AMH segment.

RECENT EVENTS

On July 6, 2022 (the “Closing Date”), we completed the acquisition of CMC Materials. We acquired all of the issued and outstanding common shares of CMC Materials for \$133.00 in cash and 0.4506 shares of our common stock per share, representing a total purchase price (inclusive of debt retired and cash assumed) of \$6.0 billion (based on our closing price on June 30, 2022), including \$3.8 billion in cash paid to CMC Materials’ shareholders, the issuance of 12.9 million shares of our common stock (excluding unvested CMC stock options and unvested CMC restricted stock units, restricted shares and performance share units equity awards assumed), \$0.9 billion of debt retired and approximately \$0.3 billion of acquired cash. We financed the cash portion of the purchase price through debt financing. See Note 10 to our consolidated financial statements included in Item 8 of Part II of this Annual Report on Form 10-K for further discussion of the debt financing that occurred prior to and on the Closing Date.

On October 11, 2022, the Company announced a definitive agreement to sell the Pipeline and Industrial Materials (“PIM”) business, which became part of the Company with the recent acquisition of CMC Materials, to Infineum USA L.P. for \$240.0

million, subject to customary purchase price adjustments. The PIM business consists of drag-reducing agents (“DRAs”), valve greases, cleaners and sealants, and related equipment supporting pipeline and adjacent industries. Effective February 10, 2023, the Company terminated the definitive agreement in accordance with its terms. At the time of the termination, the transaction had not received clearance under the Hart-Scott-Rodino Antitrust Improvements Act of 1976 (the “HSR Act”).

On January 20, 2023, the Company announced a definitive agreement to sell QED Technologies International, Inc. (“QED”), which became part of the Company with the recent acquisition of CMC Materials, to an affiliate of Quad-C Management, Inc. for approximately \$135.0 million, subject to customary purchase price adjustments. QED offers magnetorheological finishing (“MRF”) polishing and subaperture stitching interferometry (“SSI”) metrology manufacturing solutions.

THE SEMICONDUCTOR ECOSYSTEM

The manufacture of semiconductors requires hundreds of highly complex and sensitive manufacturing steps, during which a variety of materials are repeatedly applied to a silicon wafer to build integrated circuits on the wafer surface. The areas of the semiconductor ecosystem that rely most heavily on our products and solutions are described below.

Etch and Resist Strip. During the etch process, specific areas of thin film that have been deposited on the surface of a wafer are removed to leave a desired circuit pattern. After the etch process, the hardened resist must be completely removed and the etched area must be cleaned, which requires the use of high purity chemicals. Several of our products are utilized during and after the etch process, including:

- Selective etch chemistries to enable high aspect ratio structures, such as 3D-NAND;
- Formulated cleaning solutions and high-purity wet chemicals to remove photoresists and post-etch residues;
- Filters and purifiers, which help to ensure the purity of formulated cleaning chemistries and to achieve desired yields in the etch processing steps; and
- Precision-engineered coatings to provide barriers to corrosive chemistries in the etch environment, protect surfaces of equipment components from erosion and minimize particle generation.

Deposition. Deposition is a process during which certain materials are transferred to the surface of a wafer. Deposition processes include physical vapor deposition, or PVD, chemical vapor deposition, or CVD, atomic-layer deposition, or ALD, and electro-plating. We provide products that can be used during most of these deposition processes that are critical to enabling new device architectures, which are designed to ensure device performance and achieve the targeted manufacturing yields of semiconductor manufacturers, including:

- Advanced precursor materials, such as AlCl_3 , MoO_2Cl_2 , HfCl_4 , and ZrCl_4 , which are utilized to meet the semiconductor industry’s composition, uniformity and thickness requirements of deposited films; and
- Filtration and purification products, which are used to remove contaminants during the deposition process, consequently reducing defects on wafers.

Photolithography. Photolithography, a process repeated during semiconductor fabrication, is used to print complex circuit patterns onto the wafer. During this process, the wafer is coated with a thin film of light-sensitive material, called photoresist. Light is projected to expose the photoresist, which is then developed to create a pattern. Our product offerings that can be used throughout the photolithography process, include:

- Liquid filtration, high-purity packaging and high-precision dispense systems designed to ensure the pure, accurate and uniform dispense of contamination-free photoresists onto the wafer, enabling manufacturers to achieve acceptable yields in the manufacturing process; and
- Gas microcontamination control solutions designed to eliminate airborne contaminants that often disrupt effective photolithography processes.

Ion Implant. Ion implantation is a method repeated many times during semiconductor fabrication where dopants are introduced into a semiconductor wafer enhancing conductivity. Those of our products used during the ion implant process include:

- Safe Delivery Source®, or SDS®, and Vacuum Actuated Cylinders, or VAC®, gas delivery systems designed to ensure the safe, effective and efficient delivery of the necessary gases; and
- Electrostatic chucks and proprietary low temperature plasma coating processes for core components, which are critical elements of ion implantation equipment.

Chemical Mechanical Planarization. Chemical mechanical planarization, or CMP, is a polishing process used by semiconductor manufacturers to planarize, or flatten, many of the layers of material that have been deposited on silicon wafers.

We expanded our offerings used during and immediately following the CMP process with the acquisition of CMC Materials. Our offerings include:

- CMP slurries for polishing a wide range of materials used in semiconductors, including tungsten, dielectric materials, copper, tantalum (commonly referred to as “barrier”), aluminum, silicon carbide, or SiC, and gallium nitride, or GaN;
- CMP polishing pads, which are used in conjunction with slurries in the CMP process, used on a variety of polishing tools and wafers, over a range of technology nodes and applications, including tungsten, copper, and dielectrics;
- Formulated cleaning chemistries, which remove residues from wafer surfaces after the CMP process;
- Filtration and purification solutions, which are used to remove select particles and contaminants from slurries and cleaning chemistries that can cause defects on a wafer’s surface;
- Roller brushes, which are used in conjunction with our formulated cleaning chemistries to clean the wafer after completion of the CMP process in order to prepare the wafer for subsequent operations;
- Pad conditioners, which are used to prepare the surface of the CMP polishing pad prior to every polishing cycle; and
- Process monitoring and control equipment, that maintain the integrity of the CMP slurries.

Wafer and Reticle Transport. Our wafer carriers are high-purity “micro-environments” that carry wafers between manufacturing process steps. These critical products protect wafers from damage or abrasion and minimize contamination during transportation and automated processing. Protection of processed wafers is essential to our customers because wafer processing involves hundreds of steps, can take several weeks and therefore scrapping damaged wafers is costly. Our extreme ultraviolet (EUV) reticle pod is designed to provide defect-free protection of EUV reticles during shipping, storage, handling, and vacuum-transferring operations.

Chemical Handling. Semiconductor manufacturing and other high-technology manufacturing processes utilize large volumes of high-purity and hazardous chemicals. We provide solutions for the handling of such chemicals, including:

- Ultra-high purity chemical container products, such as drums, flexible packaging and associated coded connection systems, which are designed to maintain chemical purity, maximize utilization and ensure safe transport, containment and dispense of valuable, ultra-clean process fluids, from bulk chemical manufacturing to point-of-use in the manufacturing process; and
- Ultra-pure valves, fittings, tubings and sensing and control products, which are used to distribute these chemicals around the fab and in wet process tools.

Wafer and Package Testing. In our ITS business, which was added to our platform as part of the CMC Materials acquisition, we develop and manufacture high-performance consumable products for cleaning advanced probe cards and test sockets at semiconductor manufacturing facilities. We also design innovative polymer products for semiconductor fabs that improve front-end tool uptime and reduce operating costs.

Other Markets. Many of the processes used to manufacture semiconductors are also used to manufacture flat panel displays, high-purity chemicals, solar cells, optical magnetic storage devices and light-emitting diodes, or LEDs, resulting in the need for similar filtration, purification, control and measurement capabilities. We seek to leverage our products, technologies, expertise and core capabilities to address these important market opportunities and pursue opportunities in certain life sciences applications.

INDUSTRY TRENDS

Emerging and Existing Applications. The market for semiconductors has grown significantly over the past few decades, and we expect this long-term trend to continue. We believe that smartphones, 5G wireless technology, cloud computing, the Internet of Things, machine learning, artificial intelligence, high performance computing, smart transportation, smart healthcare, gaming and virtual reality will drive growth in the demand for semiconductors, drive wafer starts and create significant opportunities for our products. Existing applications in data processing, wireless communications, broadband infrastructure, personal computers, handheld electronic devices and other consumer electronics are also expected to drive demand for semiconductors, and in turn, demand for our products.

Manufacturing Complexity and Architecture. Emerging applications require more powerful, faster and more energy-efficient semiconductors. In response, semiconductor architectures are changing, with transistor design increasing in complexity, the use of multilayered patterning (for example, extreme ultraviolet lithography), structures such as FinFET, 3D NAND and gate-all-around, and shrinking dimensions. These advanced architectures require more process steps, new, innovative materials and more sophisticated contamination control. For example, leading-edge semiconductor manufacturers are moving towards atomic layer scale, where the precision of the manufacturing process and purity of the materials used is vital to maintain device integrity. These materials need to be supplied and delivered at increasing levels of purity and control,

from point-of-production to point-of-dispense on the wafer to improve and maximize yields. We believe that demand for our materials and consumable products will benefit from the increase in process steps in lithography, deposition, CMP and etch and clean required to manufacture leading-edge semiconductors.

Advanced Materials. New advanced materials have played a significant role in enabling improved device performance, and we expect this trend to continue. As dimensions get smaller, more novel materials will be required to enable transistor connectivity. We believe our portfolio of critical materials addresses the challenges our customers face as they introduce more complex architectures and search for new materials to improve the performance of their devices. These critical materials include advanced deposition materials, implant gases, CMP slurries, formulated cleaning chemistries, selective etch chemistries and high-purity wet chemicals.

Materials Purity. As feature size decreases and 3D structures proliferate, contamination control has become a critical enabler for our semiconductor customers in achieving acceptable device yields. Our advanced filtration and purification products and solutions for air, bulk or specialty gas, and wet chemicals are designed to reduce defects and enable higher yields for our customers. Our materials handling solutions protect critical materials throughout the fabrication process, allowing our customers to store, process and transport critical materials in ultra-pure environments, throughout the manufacturing process. We believe that the trend for greater materials purity will provide opportunities to utilize our capabilities to provide innovative materials management, filtration, purification, transport and process solutions to semiconductor customers.

Geopolitical Implications of the Semiconductor Industry. We have seen, and expect to continue to see, governments have an interest in fostering the development of a domestic or local semiconductor ecosystem. Examples include the CHIPS Act, EU CHIPS Act and similar initiatives in Japan and Korea. We have been proactive in light of these trends by developing a manufacturing strategy to better serve our customers as they build new fabs in various countries. Recent examples of this strategy include new facility located in Kaohsiung Science Park (“KSP”) in Taiwan and the recent announcement of our new facility in Colorado Springs, CO. Our KSP site will soon become our largest facility and will enhance our ability to serve our customers efficiently and effectively in Taiwan and other Asia-Pacific locations. The Colorado Springs site is intended to increase our service levels to new fabs expected to be built in the United States and provide us with greater manufacturing resiliency in the form of enhanced business continuity plans.

Reliance on Trusted Suppliers. Our customers require that their key materials suppliers demonstrate greater capabilities and efficiencies in their processes, including sustainability, scalability, flexible manufacturing, quality control, supply chain management and the ability to effectively collaborate on solutions to problems. We believe that we will be able to leverage our manufacturing, operational and technical capabilities, along with our broad technology portfolio and expanding scale, to become an increasingly important strategic supplier to our customers. We have deployed technical and manufacturing resources in strategic locations to enable us to collaborate with our customers. Furthermore, we believe that the greater scale we achieved from the acquisition of CMC Materials will allow us to better serve our customers, invest more in ER&D and bring complementary, co-optimized solutions to market faster than ever before.

Continued Consolidation. Our customer base within the semiconductor industry has consolidated in recent years through mergers and acquisitions. As a result, the importance of maintaining and developing strong and close relationships with our customers becomes even more essential. We also seek to further broaden our customer base by leveraging our products, technologies, expertise and core capabilities in serving semiconductor applications to address adjacent market opportunities, including in manufacturing processes for flat panel displays, high-purity chemicals, solar cells, optical magnetic storage devices, LEDs and products for life sciences applications.

OUR COMPETITIVE STRENGTHS AND BUSINESS STRATEGY

We believe that our platform is well-positioned for several reasons.

- Following the acquisition of CMC Materials, approximately 80% of our revenue during 2022 was unit driven or recurring in nature, from products consumed as a result of the semiconductor manufacturing process. As a result, our revenue is generally more impacted by overall global semiconductor demand and global GDP growth, rather than the sales of semiconductor capital equipment, which has historically been more cyclical.
- Our solutions are increasingly specified and tailored to meet our customers’ unique process conditions. Therefore, switching away from our products may be costly and time consuming for our customers and may introduce risk to their manufacturing yields.
- Our product portfolio is broad and not overly concentrated on any single product or product platform. As of December 31, 2022, we offered over 30,000 standard and customized products, and in 2022 no single product platform represented more than 4% of our net sales.

- Our customer base is diverse, and we are not overly dependent on any one single customer. As of December 31, 2022, our top ten customers make up 43% of our sales. Our customers include a broad cross-section of the semiconductor ecosystem, from chemical manufacturers, and equipment manufacturers, to semiconductor manufacturers.
- We believe the cash generated from our business will allow us to pay down our debt on the time frame we have publicly communicated, while also investing in the research and development and advanced manufacturing capabilities necessary to maintain and expand our technology leadership and to drive organic growth.

Customers Collaboration. We view the strong relationships we have with our customers, which include leading logic and memory semiconductor manufacturers, original equipment manufacturers (“OEMs”) and semiconductor materials suppliers, as critical to our long-term success. Our expansive global presence allows us to meet our customers where they operate, which has enabled us to build strong relationships with them. We intend to reinforce and further strengthen these relationships through, among other things, collaborations and joint development activity. These customer relationships provide us with collaboration opportunities at the early product design stage (in certain cases years ahead of commercialization), which facilitate our ability to introduce new products and applications that serve our customers’ needs. Due to the specialized nature of our products, complexity of our customers’ manufacturing processes, customer qualification requirements and costs associated with re-formulation and re-qualification, we believe we have a strong position with our customers.

Technology Leadership and Strong, Diverse Portfolio. Our customers need suppliers that can provide a broad range of advanced, customized, reliable and cost-effective products and materials, as well as the technological and application expertise necessary to enhance their productivity, quality and yield, especially as they drive towards more advanced technology nodes. We are committed to our strategy of providing customers with innovative technologies and solutions for their evolving manufacturing needs and we continuously seek to engage with leading logic and memory manufacturers to further advance their technology roadmaps. For example, we have introduced sub-5 nanometer filtration products, advanced deposition materials for next generation transistor and interconnect technologies, polishing slurry and pad solutions with post-cleaning formulations to meet the needs of advanced memory applications, advanced reticle pods for extreme ultra-violet, or EUV, photolithography applications, advanced 300 millimeter wafer carriers and advanced coatings to meet the rigorous defectivity specifications for the manufacturing of advanced technology nodes. We believe our comprehensive offering of materials and products creates a competitive advantage as it enables us to meet a broad range of customer needs and provide a single source of product offerings for semiconductor device and equipment manufacturers, which can often translate to shorter time-to-solution and time-to-market for our customers. Additionally, it allows us to serve many aspects of the semiconductor manufacturing ecosystem and to leverage our technology to develop co-optimized solutions.

To continue to advance our technology and product offerings, particularly to meet the needs of next generation technology nodes, we are committed to plans for significant investment in research and development initiatives, having spent approximately \$229.0 million, \$167.6 million and \$136.1 million on such activities in 2022, 2021 and 2020, respectively, representing 7.0%, 7.3% and 7.3% of our net sales, in 2022, 2021 and 2020, respectively. Our research and development efforts have been increasingly directed towards innovation for advanced technology nodes. We plan to continue making substantial investments in research and development activities.

Global Infrastructure. We have a global infrastructure of design, manufacturing, logistics, distribution, service and technical support facilities to meet the needs of our global customers. We are further enhancing this footprint with the construction of a new manufacturing center of excellence in Taiwan, our KSP facility, which will be our largest manufacturing facility and is expected to start production in 2023. In addition, we have recently announced an investment in a new facility in Colorado Spring, CO and added new capacity in liquid filtration in the Billerica, MA and Yonezawa, Japan, in deposition materials in Toronto, and materials handling in Chaska, MN and JangAn, Korea. These investments are intended to better support our customers regionally and to be even more responsive to our customers’ future growth.

Operational Excellence. Our customers are increasingly focused on the effectiveness, dependability and consistency of their supply chains. Our strategy is to continue to develop our broad supply chain and manufacturing capabilities into a competitive advantage by driving operational excellence and operating in a manner that ensures the safety of our employees and the quality of our products. We are focused on the following priorities that we believe enable us to perform at the high level that our customers expect.

- *Investing in and using manufacturing equipment and facilities incorporating leading-edge process technology, including advanced cleanroom and cleaning procedures.*
- *Implementing automated manufacturing, statistical process controls, quality and supply chain management systems.*
- *Maintaining a highly-skilled and agile organization, capable of rapid design, prototyping and ramping to high volume manufacturing while promptly responding to new customer requirements and feedback.*

Leveraging Our Collective Expertise. We leverage our expertise across our four segments and across our broad portfolio of advanced materials, materials handling and purification capabilities to create innovative, new and co-optimized solutions to

address unmet customer needs. For example, certain of our formulated cleaning chemistry products are developed and manufactured by our SCEM segment, with collaboration from our MC segment, packaged with our ultra-clean container and connector system made by our AMH segment, and delivered to the process tools through fluid handling systems also made by our AMH segment. In process tools, these chemistries may go through purification systems produced by our MC segment. Similarly, our advanced deposition materials business requires comprehensive capabilities across several disciplines, including the synthesization of unique molecules, specialized knowledge of how to purify these materials and the capability to safely transport and deliver them onto the wafer at a high throughput. With the addition of CMC Materials, we will seek to develop co-optimized, end-to-end solutions and bring them to market more quickly, such as polishing solutions for new deposition materials and optimized filtration solutions for new abrasive materials. Further, as the semiconductor industry looks to new interconnect metals like molybdenum, our portfolio of deposition precursors, CMP slurries and pads, post-CMP cleans, selective etch formulations, combined with our filtration, sensing, and delivery products will enable us to create end-to-end solutions and position our customers to enhance their device performance and yield.

Corporate Social Responsibility. We seek to embed our corporate social responsibility program into our business strategy. Our program is built around the four core pillars of Innovation, Safety, Personal Development and Inclusion and Sustainability. The program includes goals for each of the four pillars to guide us towards 2030. During 2022, we released our second annual corporate social responsibility report, which provided an update on our progress toward our 2030 goals and performance on our objectives from our 2020 baseline. Our recent corporate social responsibility accomplishments included achieving a “Silver” level from EcoVadis, an “A” rating from MSCI and receiving the ESG Supplier Award from Applied Materials, a major equipment customer. The annual corporate social responsibility report is published on our website at <http://www.Entegris.com> under “About Us - Corporate Social Responsibility.”

Adjacent Markets. We leverage the expertise that we have gained from serving the semiconductor industry, our core capabilities in material science and material purity to develop products for other industries that employ technologies and production processes that require materials integrity management, high-purity fluids and integrated dispense systems. For example, in only a few years, we brought to market our Aramus high-purity bag assemblies that are used in the production of biologics, including COVID-19 vaccines. We plan to expand the use of these solutions into non-COVID biologics, to provide ancillary solutions around our Aramus bags, and to expand our filter offerings for bioprocessing applications. In addition, our products are used in manufacturing processes for flat panel displays, high-purity chemicals, solar cells, optical magnetic storage devices, LEDs and for other life sciences and aerospace applications. We plan to continue to identify and selectively develop derivative products that address needs in adjacent markets, and in doing so, we expect to increase the total available market for our products and increase our return on R&D investments.

Strategic Acquisitions, Partnerships and Related Transactions. After we integrate CMC Materials and achieve our debt reduction targets, we will continue to pursue strategic acquisitions and business partnerships that enable us to address gaps in our product offerings, secure new customers, diversify into complementary product markets, broaden our technological capabilities and product offerings, access local or regional markets and achieve benefits of increased scale. We believe we have a strong track record of executing these transactions and their integration. Our acquisition of CMC Materials significantly broadened our product and technology capabilities and increased our scale. In the last several years, we have strengthened and expanded our product portfolio with the following acquisitions: BASF’s precision microchemicals business in 2021; Sinmat in 2020 (CMP slurries in hard substrate applications); and Global Measurement Technologies, Inc. in 2020 (analytical instruments for chemistry management and monitoring). Further, we will reevaluate our existing businesses from time to time and may decide to sell, restructure or replace one or more businesses, such as the pending sale of our QED business. Finally, we regularly evaluate opportunities for strategic alliances, joint development programs and other strategic investments to achieve a variety of objectives including expanding our manufacturing capacity, producing products closer to our customers, developing optimized products more quickly and developing new sources of supply to provide us with a competitive advantage.

OUR SEGMENTS

Our business is organized and operated in four segments which align with the key elements of the advanced semiconductor manufacturing ecosystem: Specialty Chemicals and Engineered Materials, or SCEM; Microcontamination Control, or MC; Advanced Materials Handling, or AMH and Advanced Planarization Solutions, or APS. We leverage our expertise from these four segments to create new and increasingly integrated solutions for our customers. The following is a detailed description of our four segments.

SPECIALTY CHEMICALS AND ENGINEERED MATERIALS SEGMENT

The SCEM segment provides high-performance and high-purity process chemistries, gases and materials that enhance our customers’ product performance. Advanced materials, delivered at high purity, are critical to enabling the performance of leading-edge logic and memory applications. We believe the growing long-term demand in the advanced logic and memory market, challenges with metallization schemes and the need for specialized cleaning solutions will drive demand in our SCEM segment. In conjunction with products from our MC and AMH segments, our SCEM segment provides unique solutions to

safely and efficiently deliver critical materials to support semiconductor and other advanced manufacturing processes and we believe opportunities exist to create end-to-end solutions for our customers, for example, by co-optimizing CMP slurries, pads and cleans from our APS segment with advanced deposition materials from our SCEM segment.

Specialty Gas Products. Our specialty gas solutions provide advanced safety and process capabilities to semiconductor, display and solar panel manufacturers. Our SDS cylinders store and deliver hazardous gases, such as arsine, phosphine, germanium tetrafluoride and boron trifluoride, at sub-atmospheric pressure through the use of our proprietary carbon-based adsorbent materials. These products are designed to minimize potential leaks during transportation and use and allow more gas to be stored in the cylinder, features which provide significant safety, environmental and productivity benefits over traditional high-pressure cylinders. We also offer VAC, a complementary technology to SDS, where select implant gases and gas mixtures are stored under high pressure but are delivered sub-atmospherically.

Advanced Deposition Materials Products. Our advanced deposition materials include advanced liquid, gaseous and solid precursors, including organometallic precursors for the deposition of tungsten, titanium, cobalt, aluminum, molybdenum and ruthenium containing films and organosilane precursors for the deposition of silicon oxide and silicon nitride films. These precursors are designed in close collaboration with OEM process tool manufacturers and device makers to produce application specific solutions that are compatible with complex integrations of material solutions used to build the semiconductor device. We offer delivery systems and containers that allow for reliable storage and delivery of low volatility solid and liquid precursors required in atomic layer deposition processes. When combined with our proprietary corrosion-resistant coatings and filtration solutions from our MC segment, we believe our advanced deposition solutions enable the industry's highest purity levels, resulting in improved device performance.

Surface Preparation and Integration Products. We offer a range of materials used to prepare the surface of a semiconductor wafer during the manufacturing process and to integrate with materials being used on the wafer. We offer a broad range of cleaning solutions for applications such as semiconductor post-etch residue removal, wafer etching, organics removal, negative resist removal, edge bead removal and corrosion prevention. In addition, we offer selective etch products designed to enable advanced architectures such as 3D-NAND. Our wet chemistry solutions, combined with filtration solutions from our MC segment and fluid handling solutions from our AMH segment, are designed to provide enhanced purity, which results in improvements in our customers' processes. We also provide advanced plating solutions, such as our Viaform® product (a trademark of and exclusively licensed from Element Solutions, Inc.), which includes inorganic and proprietary organic molecules that provide the wiring for copper interconnects.

Specialty Materials Products. Our specialty materials include specialized graphite, silicon carbide and a variety of unique, high purity coatings for dry or plasma etch, chemical vapor deposition and ion implant applications. Our POCO® premium graphite is used to make precision consumable electrodes for electrical discharge machining, hot glass contact materials for glass product manufacturing and forming and other consumable products for various industrial applications, including aerospace, optical, medical devices, air bearings and printing. Our high-performance specialty coatings, such as our Pegasus™ and Cearus™ coatings, provide erosion resistance, minimize particle generation and prevent contamination on critical components in semiconductor environments and other high-technology manufacturing operations. Our specialty materials provide customized solutions for applications challenged with unique temperature, corrosive, chemical or process environments, such as electrostatic chucks used to hold wafers during processing, plasma etch chamber components, aircraft bearings and ultrasonic transducers.

Specialty Chemicals. Our specialty chemicals include advanced liquid and solid materials, which are used in a range of high-performance material applications ranging from medical devices to materials used in semiconductor applications. In addition, our specialty chemicals business provides materials to a number of our other businesses to enable advanced performance of product solutions.

Materials Technologies. In our ITS business, we develop and manufacture high-performance consumable products for cleaning advanced probe cards and test sockets at semiconductor manufacturing facilities. These engineered polymer solutions are designed to improve customer yields and throughput in wafer and package test operations at semiconductor device manufacturers, foundries, and outsourced semiconductor assembly and test (OSAT) facilities. We also design innovative polymer products for semiconductor fabs that improve front-end tool uptime and reduce operating costs.

In addition, our PIM business, which consists of DRAs, valve greases, cleaners and sealants, and related equipment supporting pipeline and adjacent industries, and our QED business, which offers MRF polishing and SSI metrology manufacturing solutions, report into our SCEM segment. The sale of the QED business, as further described above, is pending.

MICROCONTAMINATION CONTROL SEGMENT

The MC segment offers solutions to purify critical liquid chemistries and process gases used in semiconductor manufacturing processes and other high-technology industries. Our liquid and gas filtration and purification products are critical to the

semiconductor manufacturing process because they remove contamination, directly reduce defects, improve manufacturing yield and enhance the long-term reliability of the semiconductor device. Our proprietary filters remove organic and inorganic nanometer-sized contaminants from various fluids and gases used in the manufacturing process, including photolithography, deposition, planarization and surface etching and cleaning. We believe demand for purification and filtration products is being driven by the continuous node shrink in logic semiconductors and the ramp in the 3D NAND market, as the risk and cost of yield loss grows with the incremental manufacturing steps needed for the production of these devices. We utilize expertise from the AMH segment in polymer science, from the SCSEM segment in formulated cleaning chemistries and APS segment in slurry formulation to develop differentiated filtration and purification solutions for our customers.

Liquid Microcontamination Control Products. We offer a variety of products that control contaminants in our customers' wet processes both in the fab environment and upstream at the chemical manufacturers. For example, our Torrento® series of filters is used for the filtration of aggressive acid and base chemistries for both semiconductor fabs as well as specialty chemical manufacturers, including our SCSEM segment. Manufacturers of high purity chemicals and semiconductor fabs use our Trinzik® and Microgard™ products for the filtration of chemicals and ultra-pure water. Our Impact® series of filters are used in point-of-use photochemical dispense applications, including those provided by our AMH segment, where the delivery of superior flow rate performance and reduced microbubble formation is critical. Our Protego® series of liquid purifier/filter products are used to reduce metallic contamination in chemical manufacturing and in critical wafer rinsing and drying applications by our customers. In addition, we provide membrane and liquid filtration offerings serving semiconductor, pharmaceutical and medical applications.

Gas Microcontamination Control Products. We offer a broad portfolio of products designed to remove particulate and molecular contaminants from controlled environments and gas streams in semiconductor, flat panel display and LED fabs. Our Wafergard® gas filters reduce outgassing and remove particle contamination. Our GateKeeper® gas purifiers and large facility-wide gas purification systems provide continuous purified gas supply to customer fabs from the point of creation on the gas pads to the point-of-use at the wafer by chemically reacting and absorbing contaminants, effectively removing gaseous contaminants down to part-per-trillion levels. Our Chambergard™ gas diffusers provide semiconductor equipment manufacturers with the capability to rapidly vent their tools to atmosphere to dramatically reduce process cycle times without adding particles to the wafers. In addition, our Vaporsorb products are used to eliminate airborne molecular contamination from critical process tool areas or cleanrooms in the fab. These products are used in or alongside critical processing tools to improve yield and reduce tool downtime.

ADVANCED MATERIALS HANDLING SEGMENT

The AMH segment develops solutions to monitor, protect, transport and deliver critical liquid chemistries, wafers and substrates for a broad set of applications in the semiconductor and other high-technology industries. These systems and products improve our customers' yields by protecting wafers from abrasion, degradation and contamination during manufacturing and transportation and by assuring the consistent, clean and safe delivery of advanced chemicals from the chemical manufacturer to the point-of-use in the semiconductor fab. The AMH segment collaborates closely with our SCSEM and APS segments in developing products that are compatible with advanced chemistries to enhance yields and integrates liquid filtration technology from our MC segment to deliver consistent and pure chemistry.

Microenvironment Solutions. Our high-volume line of Ultrapak® products for wafers ranging from 100 to 200 millimeter ensure the clean and secure transport of wafers from the wafer manufacturers to the semiconductor fabs. We also offer a front-opening shipping box, or FOSB, for the transportation and automated interface of 300 millimeter wafers. We lead the market for 300 millimeter front-opening unified pods, or FOUPs, wafer transport and process carriers and standard mechanical interface pods, or SMIF pods, for 200 millimeter wafer applications. We are a leader in reticle protection products for photolithography, including products that protect the high-value EUV lithography masks during both the mask manufacturing process and their use in the semiconductor fab.

Fluid Management Products. Our broad portfolio of packaging and container products, from low-volume containers to transport high-value photoresist chemistries, such as our NOWPak® products, to large intermediate bulk containers, such as our FluoroPure® products, ensure the purity of the chemistries they contain. We are a leader in high-purity fluid handling products such as valves, fittings, tubing, piping and associated connection systems, such as our PrimeLock® connections, for high-purity chemical applications. Our proprietary digital flow control technology improves the uniformity of chemicals applied on wafers. For example, our IntelliGen® integrated, high-precision liquid dispense systems enable the uniform application of advanced chemistries during the wafer fabrication process, integrating our valve control expertise with filter device technologies from our MC segment, in order to conserve high-value chemistry and reduce defects on wafers. Further, we provide market-leading instrumentation solutions to ensure consistency and monitoring of complex blended chemistries, such as our on-tool Accusizer® system, which performs automated online particle size and count analysis with applications in both semiconductor and life science industries, and our SemiChem® systems and our Invue® products, which measure chemical concentration in CMP slurries and formulated cleaning chemistries.

ADVANCED PLANARIZATION SOLUTIONS SEGMENT

The APS segment provides complementary CMP solutions including CMP slurries, pads, pad conditioners, post-CMP brushes and formulated cleaning chemistries, and high-purity wet electronic chemicals, that are critical to semiconductor and hard disk drive manufacturing processes and that enhance device yields. CMP enables semiconductor device manufacturers to produce smaller, faster, and more complex chips with a greater density of transistors and reduce defects, which increases yield. The APS segment designs and manufactures products and solutions to remove excess material that is deposited during the semiconductor manufacturing process and to level and smooth the surfaces of the layers of semiconductor devices via a combination of chemical reactions and mechanical abrasion, leaving minimal residue and defects on the surface, with only the material necessary for circuit integrity remaining. The APS segment collaborates with our SCEM segment to better understand the materials deposition process and film composition with a view to co-optimizing our CMP products to better meet our customers' needs. Our APS segment also partners closely with our AMH segment to ensure that its products and solutions are transported and delivered in a way that ensures maximum purity and stability. In addition, as CMP slurries and cleans require advanced filtration both in manufacturing and at the point of use in the semiconductor manufacturing environment, the APS segment partners with our MC segment to optimize its products and processes in order to achieve industry-leading purity levels.

CMP Slurries. The APS segment develops, produces, and sells CMP slurries for polishing a wide range of materials used in semiconductor devices, including tungsten, dielectric materials, copper, barrier, aluminum, and other emerging materials used in semiconductor device fabrication and for polishing bare silicon wafers as well as disk substrates and magnetic heads used in hard disk drives. We also offer slurry products used for polishing ultra-hard surface materials, including SiC and GaN substrates, which are utilized in power electronics and advanced communications end-markets. We believe that we are uniquely positioned to be able to develop and optimize new slurries that can be utilized on emerging materials used in semiconductor device fabrication, such as molybdenum and ruthenium.

CMP Pads. CMP pads are critical in the CMP process to flatten and polish wafers and can have a significant impact on process performance. Our CMP Pads, such as our NexPlanar™, Medea™ and Ultra pad products are designed to provide the exact hardness, pore sizes, compressibility, and groove patterns needed to meet and exceed the requirements of various CMP applications. Our Epic Power™ CMP Pads are designed for SiC wafers and offer a balance of best-in-class performance, quality, and cost of ownership. In addition, our Planargem® pad conditioners, based on our silicon carbide capabilities, lengthen CMP pad life and protect against conditioner-induced defectivity.

Post-CMP Cleans. Our post-CMP clean chemistry products, such as PlanarClean® and ESC 784, are designed to efficiently remove the abrasive slurry particles and organic residue from the wafer after the CMP process, removing residue that might affect yield while not contributing to contamination. In addition, our consumable polyvinyl alcohol roller brush products are used to clean the wafer following the CMP process.

Electronic Chemicals. We offer semiconductor-grade wet chemicals with purities that extend to the parts-per-trillion (ppt) level. We produce and sell high-purity process chemicals through the formulation, purification, and blending of acids, solvents, and other wet chemicals primarily used to etch, clean, and dry silicon wafers during the production of semiconductors, hard disk drives, photovoltaics (solar cells), and flat panel displays. Our electronic chemicals products include sulfuric, phosphoric, nitric and hydrofluoric acids, ammonium hydroxide, hydrogen peroxide, isopropyl alcohol, other specialty organic solvents and various blends of chemicals. As the integrated circuit ("IC") manufacturing process moves to more advanced technology nodes and the complexity of the process continues to increase, quality and purity of the materials become even more critical to the device yield. Increasing levels of purity and achieving lower levels of variation in our electronic chemicals business are required to enable next-generation IC technologies. Our advanced chemical purification technologies, including distillation, ion exchange, gas adsorption, and filtration, are designed to provide consistently low contaminant levels in a variety of high-purity process chemicals.

OUR CUSTOMERS AND MARKETS

Our customers include logic and memory semiconductor device manufacturers, semiconductor equipment makers, gas and chemical manufacturing companies and wafer grower companies serving the global semiconductor industry. We also sell our products to outsourced semiconductor assembly and test (OSAT) facilities, flat panel display equipment makers, panel manufacturers, manufacturers of hard disk drive components and devices and their related ecosystems.

Our other high-technology markets include manufacturers and suppliers in the solar and life science industries, electrical discharge machining customers, glass and glass container manufacturers, aerospace manufacturers and manufacturers of biomedical implantation devices.

Below is a table showing the percentage of our net sales to top customers and the percentage of our net sales that are international during the three most recent fiscal years.

	2022	2021	2020
Percentage of net sales to top customers:			
TSMC	12 %	12 %	11 %
Remaining top ten customers	31 %	31 %	35 %
Total top ten customers	43 %	43 %	46 %
Percentage of net sales by market:			
Domestic/US	24 %	23 %	25 %
Foreign/International	76 %	77 %	75 %

We may enter into supply agreements with our customers. These agreements generally have a term of one to three years, but typically do not contain any long-term purchase commitments. Instead, we work closely with our customers to develop non-binding forecasts of the future volume of orders. However, customers may cancel their orders, change production quantities from forecasted volumes or delay production for reasons beyond our control.

SALES, MARKETING AND SUPPORT

We sell our products worldwide, primarily through our direct sales force and strategic independent distributors located in all major semiconductor markets. Independent distributors are also used in other market territories and for specific market segments. As of December 31, 2022, our sales and marketing force consisted of approximately 788 employees worldwide.

Our unique capabilities and long-standing industry relationships have provided us with the opportunity for significant collaboration with our customers at the product design stage, which has facilitated our ability to introduce new materials and new solutions that meet our customers' needs. We continuously seek to identify for our customers a variety of materials, contamination and process control challenges that may be addressed by our product solutions. Our sales representatives provide our customers with worldwide technical support and information about our products and materials.

We believe that our technical and application support services are important to our sales and marketing efforts. These services include assisting in defining a customer's needs, evaluating alternative products and materials, designing a specific system to perform the desired operation, training users and assisting customers in compliance with relevant government regulations. Additionally, our field application engineers, located in major markets we serve, work directly with our customers on product qualification and process improvements in their facilities. We maintain a network of service centers, applications laboratories and technology centers located in key markets internationally and in the United States to support our products and our customers with their advanced development needs, provide local technical service, application support and help ensure fast turnaround time.

COMPETITION

The market for our products is highly competitive. While price is an important factor, we compete primarily on the basis of the following factors:

- technical expertise;
- product quality and performance;
- advanced manufacturing capabilities;
- total cost of ownership;
- historical customer relationships;
- breadth of product line;
- time to solution;
- supply chain resiliency;
- breadth of geographic presence;
- customer collaboration, service and support; and
- after-sales service.

We believe that we compete favorably with respect to the factors listed above. We believe that our key competitive strengths include our broad product line, our strong research and development infrastructure and investment, our manufacturing excellence, our advanced quality control systems, the low total cost of ownership of our products, and our applications expertise in semiconductor manufacturing processes. However, our competitive position varies depending on the market segment and specific product areas within these segments. While we have longstanding relationships with a number of semiconductor and other electronic device manufacturers, we still face significant competition from companies that also have longstanding relationships with other semiconductor and electronic device manufacturers and, as a result, have been able to have their products specified by those customers for use in their fabrication facilities.

The competitive landscape is varied, ranging from business segments within large multinational companies to small regional or regionally-focused companies. While product quality and technology remain critical, overall, industry trends are indicating a

shift to localized, cost-competitive and consolidated supply chains. Because of the unique breadth of our capabilities, we believe that there are no global competitors that compete with us across the full range of our product offerings. Notable competitors with respect to certain specific product areas include Pall Corporation (part of Danaher Corporation), Shin-Etsu Polymer Co., Ltd., the EMD Performance Materials division of Merck KGaA, the Electronics & Industrial division of DuPont de Nemours, Inc., the Electronics Advanced Materials division of Air Liquide, Linde plc, Anji Microelectronics (Shanghai) Co., Ltd., and Mersen.

ENGINEERING, RESEARCH AND DEVELOPMENT

We believe that technology is important to the success of our businesses, and we plan to continue to devote significant resources to engineering, research and development, or ER&D, balancing efforts between shorter-term market needs and longer-term investments. As of December 31, 2022, we had approximately 1,392 employees in ER&D. We have supplemented and may continue to supplement our internal research and development efforts by licensing technology from third parties and/or acquiring rights with respect to products incorporating externally owned technologies. Our R&D expenses consist of personnel and other direct and indirect costs for internally funded project development, including the use of outside service providers.

We believe we have a rich pipeline of development projects. Our ER&D efforts are directed toward developing and improving our technology platforms for semiconductor and advanced processing applications and identifying and developing products for new applications, often working directly with our customers to address their particular needs.

We have ER&D capabilities in the United States, Canada, China, Japan, South Korea, Taiwan, Singapore and Malaysia to meet the global needs of our customers. We use sophisticated methodologies to research, develop and characterize our materials and products. Our capabilities to test and characterize our materials and products are focused on continuously reducing risks and threats to the integrity of the critical materials that our customers use in their manufacturing processes.

In addition, we collaborate with leading universities and industry consortia, such as the University of California, Yale University, Pennsylvania State University, University of Illinois (Champaign Urbana), SUNY Albany, the Interuniversity Microelectronics Center (imec®) and CEA-LETI. We undertake this work to extend the reach of our internal R&D and to gain access to leadership ideas and concepts beyond the time horizon of our internal development activities.

PATENTS AND OTHER INTELLECTUAL PROPERTY RIGHTS

As of December 31, 2022, we owned approximately 4,400 active patents worldwide, of which about 850 were United States patents. Additionally, we owned about 2,000 pending patent applications globally. In addition, we license certain patents owned by third parties. We rely on a combination of patent, copyright, trademark and trade secret laws and license agreements to establish and protect our proprietary rights. We seek to refresh our intellectual property on an ongoing basis through continued innovation. While we license and expect to continue to license technology used in the manufacture and distribution of products from third parties, we do not consider any particular patent or license to be material to our business.

We vigorously protect and defend our intellectual property. We require each of our employees, including our executive officers, to enter into agreements with us pursuant to which the employee agrees to keep our proprietary information confidential and to assign to us inventions made during the course of employment. We also require outside scientific collaborators, sponsored researchers and other advisors and consultants who are provided confidential information to execute confidentiality agreements with us. These agreements generally provide that all confidential information developed or made known to the entity or individual during the course of the entity's or individual's relationship with the Company is to be kept confidential and not disclosed to third parties except in specific limited circumstances.

MANUFACTURING

Our customers rely on our products and materials to ensure the integrity of the critical materials used in their manufacturing processes by providing purity, cleanliness, consistent performance, dimensional precision and stability. Our ability to meet our customers' expectations, combined with our substantial investments in worldwide manufacturing capacity and comprehensive supply chain strategy, position us well to respond to the increasing demands from our customers for yield-enhancing materials and solutions.

To meet our customers' needs worldwide, we have established an extensive global manufacturing network with facilities in the United States, Canada, China, France, Italy, Japan, Malaysia, Singapore, South Korea, Taiwan and the United Kingdom. Because we work in an industry where contamination control is paramount, we maintain Class 100 to Class 10,000 cleanrooms for manufacturing and assembly. We believe that our worldwide advanced manufacturing capabilities are important competitive

advantages. These include:

engineered polymer conversion and processing;
advanced membrane modification and cleaning;
chemical formulation, blending, distillation,
synthesis and purification;
gas delivery systems;
high-purity gas handling and transfilling;
high-purity materials packaging;
membrane casting;
cartridge manufacturing and assembly;

specialty coating capabilities;
solids and powders compounding and handling;

graphite synthesis;
blow molding;
rotational molding;
machining; and
assembly.

We have made significant investments in systems and equipment to create innovative products and tool designs, including metrology and 3D printing capabilities for rapid analysis and prototype production. In addition, we use contract manufacturers for certain of our products both in the United States and Asia.

RAW MATERIALS

Our products are made from a wide variety of raw materials that are generally available from multiple sources of supply. Our strategy is to secure various sources of different raw materials, as appropriate, to enable the desired performance of our products, and monitor those sources as necessary to provide supply assurance. While we seek to have several sources of supply for raw materials, certain materials included in our products, such as certain filtration membranes in our MC segment, petroleum coke and specialty and commodity chemicals in our SCEM segment, certain polymer resins in our AMH segment, and certain engineered abrasive particles in our APS segment, are obtained from a single source or a limited group of suppliers or from suppliers in a single country. We have entered into multi-year supply agreements with certain suppliers for the purchase of raw materials in the interests of supply assurance and cost control.

GOVERNMENTAL REGULATION

Our operations are subject to federal, state and local regulatory requirements relating to export controls, environmental, waste management and health and safety matters, including measures relating to the release, use, storage, treatment, transportation, discharge, disposal and remediation of contaminants, hazardous substances and wastes, as well as practices and procedures applicable to the construction and operation of our plants. Although some risk of costs and liabilities related to these matters is inherent in our business, we believe that our business is operated in substantial compliance with applicable regulations. However, new, modified or more stringent requirements or enforcement policies could be adopted, which could adversely affect us. While we expect that capital expenditures will be necessary to ensure that any new manufacturing facility is in compliance with environmental and health and safety laws, we do not expect these expenditures to be material.

HUMAN CAPITAL RESOURCES

We believe that our employees are a critical asset in achieving our mission of helping our customers improve their productivity, performance and technology by providing enhanced materials and process solutions for the most advanced manufacturing environments. In order to attract and retain top talent, we are focused on creating a diverse, inclusive and safe workplace and are committed to our efforts to provide competitive total rewards and quality development and training opportunities for our employees.

As of December 31, 2022, we had approximately 10,000 employees, of whom approximately 52%, 16%, 9%, 7%, 6%, 6%, 3% and 1% are located in North America, Southeast Asia, Japan, Taiwan, South Korea, China, Europe and Canada, respectively. Given the variability of business cycles in the semiconductor industry and the rapid response time required by our customers, it is critical that we be able to quickly adjust the size of our production staff to meet our customers' demands and maximize efficiency and we use skilled temporary labor when possible. Some of our full-time employees are represented by labor unions, works councils or comparable organizations, particularly in Europe. We believe that our labor relations have generally been good.

Culture. Our organization is built around what we refer to as our PACE values: our core values of treating people with respect and dignity, acting honestly and consistently, encouraging creativity and innovation and a dedication to excellence. We believe that by continuing to focus on these values, we provide our employees with a positive work environment that allows them to develop professionally and encourages them to continue innovating. We regularly conduct surveys of our employees to understand their perspectives on a number of topics. During 2022, these topics included commitment to Entegris' core values, safety and general employee satisfaction. Management uses the

information gathered from these surveys to inform its decision making with respect to employee matters, aiming to continue to be an employer of choice.

Diversity and Inclusion. We believe that maintaining a culture of diversity and inclusion helps enable us to innovate more effectively and perform better overall. We are committed to making progress on our diversity and inclusion journey. To that end, we seek to promote diverse backgrounds and perspectives throughout our organization and strive to provide fair and equal opportunity for career development and advancement to all our employees. An example of our commitment to fostering diversity and inclusion at Entegris is our Employee Network groups, which are designed to advance diversity and inclusion and to promote our workplace as an environment where all individuals are valued for their talents and feel empowered to reach their fullest potential. As of December 31, 2022, our six Employee Networks included groups focused on gender identity, sexual orientation, age and veteran status.

Health and Safety. Our success depends on the well-being of our employees. We maintain a culture with an intense focus on safety and strive to identify, eliminate and control risk in the workplace in an effort to prevent injury and illness. Our employees have access to a global safety management system and are encouraged to report incidents, near misses or other observations in the system. The system has been widely adopted in our manufacturing locations across the globe, and management uses the information generated by it to set safety-related policies and to set goals for future performance.

We also design our products with the safety of the people who are using them in mind. Our Safe Delivery Source products are designed to minimize potential leaks during transportation and use of hazardous gases, features which provide significant safety, environmental and productivity benefits over traditional high-pressure cylinders. In addition, our fluid handling products, such as tubing, valve, fittings and drum products, are used to safely store, transport and dispense volatile and dangerous chemistries, protecting those who work with them.

Total Rewards. We are focused on enhancing our high-performance organization. To achieve this goal, we seek to attract and retain talented employees by providing compelling total rewards, encompassing pay, benefits and other programs, that enrich our employees, both personally and professionally. For example, we provide our employees with a comprehensive benefits package that includes health insurance and other resources that support their physical and mental well-being. Our total rewards program is designed to be attractive and competitive and to enable our employees to reach their highest potential by directly impacting their financial security, career growth opportunities and the health and well-being of them and their families.

Talent Development and Training. We are committed to the continued development and training of our employees. We conduct formal evaluations with each of our employees on an annual basis, and managers provide feedback directly to employees through informal review sessions periodically throughout the year. Our formal evaluation process requires employees to track whether they met certain development goals that are set at the beginning of the review period. While we continue to search for new perspectives and insights with external hires, we also seek to provide opportunities for our employees to grow their careers and regularly fill open vacancies with internal candidates. In addition, management periodically assesses succession planning for certain key positions and reviews our workforce to identify high potential employees for future growth and development.

We also provide formal and informal training opportunities for our employees covering a variety of professional, technical and leadership topics. Our training opportunities are designed to promote learning across all levels of our organization, and in 2022 our formal training offerings included management trainings and the development of both technical and soft skills.

Philanthropy. Recognizing our unique opportunity as a science-based company to effect positive change, the Entegris Foundation was established in 2020 to expand access to STEM (science, technology, engineering and math) education in underrepresented communities. The Entegris Foundation provides scholarship opportunities to underrepresented students pursuing a STEM major in colleges across the U.S. and in Korea, Taiwan and Japan. We have set a goal of investing more than \$30 million in STEM scholarships and engineering internships for women and individuals from underrepresented communities by 2030.

Oversight. Our Board of Directors, through the Management Development and Compensation Committee, provides oversight on human capital matters through a variety of methods and processes. These include regular updates and discussion related to human capital management efforts and other initiatives impacting the workforce, health and safety matters, employee survey results, hiring and retention, employee demographics, labor relations, compensation and benefits, succession planning and employee training initiatives. We believe the Board's oversight of these matters helps identify and mitigate exposure to labor and human capital management risks, and is part of the broader framework that guides how we attract, retain and develop a workforce that aligns with our values and strategies.

For additional information on these important initiatives, see our annual corporate social responsibility report on our website at <http://www.Entegris.com> under "About Us - Corporate Social Responsibility."

OUR HISTORY

The Company was incorporated in Delaware on March 17, 2005 in connection with a merger between Entegris, Inc., a Minnesota corporation, and Mykrolis Corporation, a Delaware corporation. On April 30, 2014, the Company acquired ATMI, based in Danbury, CT. On July 6, 2022, the Company acquired CMC Materials, based in Aurora, IL. Entegris has been helping its customers solve their critical materials challenges and enhance their manufacturing yields for over 55 years, tracing its corporate origins back to Fluoroware, Inc., which began operating in 1966.

AVAILABLE INFORMATION

Our Internet address is www.entegris.com. On this website, under the “About Us-Investor Relations-Financial Information” section, we post the following filings as soon as reasonably practicable after they are electronically filed with, or furnished to, the U.S. Securities and Exchange Commission, or SEC: our annual, quarterly, and current reports on Forms 10-K, 10-Q, and 8-K; our proxy statements; any amendments to those reports or statements, and Form SD. All such filings are available on our website free of charge. The SEC also maintains a website (www.sec.gov) that contains reports, proxy and information statements, and other information regarding issuers that file electronically with the SEC. The content on our website and any other website as referred to in this Form 10-K is not incorporated by reference into this Form 10-K unless expressly noted.

Item 1A. Risk Factors.

In addition to the other information in this Annual Report on Form 10-K, the following risk factors should be carefully considered in evaluating us and our common stock. Any of the following risks, many of which are beyond our control, could materially and adversely affect our financial condition, results of operations or cash flows or cause our actual results to differ materially from those projected in any forward-looking statements. We may also face other risks and uncertainties that are not presently known, are not currently believed to be material or are not identified below because they are common to all businesses. Past financial performance may not be a reliable indicator of future performance and historical trends should not be used to anticipate results or trends in future periods. For more information, see “Cautionary Statement” in Item 7 of this Annual Report on Form 10-K.

Risk Factor Summary

Risks Related to Our Business and Industry

- The impact of declines in industry or worldwide economic conditions.
- Uncertain geopolitical conditions.
- Variability of revenues and operating results.
- The evolving nature of the industries we serve and the impact of changes in products and technology.
- Supply chain risks.
- The impact of the COVID-19 pandemic.
- Operation of a global business.
- The impact of tariffs, export controls and other trade laws and restrictions, especially with respect to China.
- Customer concentration.
- Continuing innovation and introduction of new products.
- Risks related to competition.
- Our ability to successfully acquire or integrate other businesses, form joint ventures or divest businesses.
- The impact of disruptions to our operations.
- The use of hazardous materials in our operations.
- Loss of key employees.
- Our ability to obtain, protect and enforce intellectual property rights.
- The impact of information technology system failures, network disruptions and breaches in data security.
- The impact of climate change.
- The costs and reputational risk associated with our environmental, social and governance initiatives.

Risks Related to Government Regulation

- The impact of environmental laws and regulations.
- Risks related to the regulatory environment.
- Changes in taxation or adverse tax rulings.

Risks Related to Our Merger with CMC Materials

- The integration of CMC Materials.

Risks Related to Our Indebtedness

- The impact of our indebtedness.
- Restrictions on our operations as a result of the terms of the Credit Agreements and the Indentures.

Risks Related to Owning our Common Stock

- The volatility of the price of our common stock.
- Changes in capital allocation strategy.
- Provisions in our charter documents and Delaware law may delay or prevent us from being acquired.

Risks Related to Our Business and Industry

Declines in the semiconductor industry or worldwide economic conditions may cause demand for our products to decrease and may adversely affect our business.

Declines in industry or worldwide economic conditions, including the prospect of a recession, rising inflation, fluctuating foreign currency exchange rates and interest rates or tightening credit markets, may adversely affect our business. Our revenue is primarily dependent upon demand from semiconductor manufacturers, which is largely driven by the current and anticipated demand for electronic products that utilize semiconductors. Despite secular trends of increasing demand for semiconductors in

applications such as smartphones, 5G wireless technology, cloud computing, the Internet of Things, machine learning, artificial intelligence, high performance computing, smart transportation, smart healthcare, gaming and virtual reality, the semiconductor industry has historically been, and is likely to continue to be, cyclical with periodic significant downturns, resulting in significantly decreased demand for products such as ours. We have previously experienced significant revenue deterioration and operating losses due to severe downturns in the semiconductor industry, which often occur suddenly. The semiconductor industry is also affected by seasonal shifts in demand, and as a result, we expect short-term fluctuation of demand within several quarters. We are unable to predict the timing, duration or severity of any future downturns in the semiconductor industry.

During downturns and periods of soft demand, our revenue is reduced, and we typically experience greater pricing pressure and shifts in product and customer mix, which often adversely affect our gross margin and net income. Furthermore, to remain competitive, we must maintain our engineering, research and development activity, invest in our infrastructure and maintain flexibility to respond to any increases in demand. As a result, a lower volume of sales can have a large and disproportionate impact on our profitability. Even moderate seasonality can cause our operating results to fluctuate significantly from one period to the next. Uncertain and volatile economic, political, public health or business conditions in any of our key sales regions can cause or exacerbate negative trends in business and consumer spending and have historically impacted customer demand for our products. These conditions can cause material adverse changes in our results of operations and financial condition, including:

- a decline in demand for our products, which would have an immediate impact on our revenues;
- an increase in reserves for accounts receivable due to our customers' inability to pay us;
- lower utilization of our manufacturing facilities, which could lead to lower margins;
- an increase in write-offs for excess or obsolete inventory that we cannot sell;
- potential impairment charges relating to goodwill, intangible assets, manufacturing equipment or other long-lived assets, to the extent that any downturn indicates that the carrying amount of the asset may not be recoverable;
- greater challenges in forecasting operating results, making business decisions and identifying and prioritizing business risks; and
- additional cost reduction efforts, including additional restructuring activities, which may adversely affect our ability to capitalize on opportunities.

Our revenues and operating results are variable.

Our revenues and operating results may fluctuate significantly from quarter-to-quarter or year-to-year due to a number of factors, many of which are outside our control. We manage our expenses based in part on our expectations of future revenues. Because some of our expenses are relatively fixed in the short term, a change in the timing of revenue or the amount of profit we generate from a small number of transactions can unfavorably affect operating results in a particular period. Factors that may cause our financial results to fluctuate unpredictably include:

- economic conditions in the semiconductor industry or in the other industries we serve;
- the size and timing of customer orders;
- consolidation of our customers, which could impact their purchasing decisions and negatively affect our revenues;
- procurement shortages, increased prices, the failure of suppliers to perform their obligations and additional expenses to respond promptly to any supply shortages or other supplier problems;
- decisions to increase or accelerate our purchasing of raw materials, components or other supplies in an effort to mitigate supply risk;
- changes in our capital expenditure requirements, such as our KSP facility in Taiwan and our newly announced planned facility in Colorado Springs, and the schedule and timing, including potential delays, thereof;
- manufacturing difficulties;
- customer decisions to decelerate orders in order to draw down their inventory;
- customer cancellations of or delays in shipments, installations or customer acceptances or, alternatively, acceleration of orders from customers to increase their inventory;
- our customers' rate of replacement of our consumable products or decision to delay expansion projects;
- changes in average selling prices, customer mix and product mix;
- our ability to develop, introduce and market new, enhanced and competitive products in a timely manner;
- our competitors' introduction of new products;

- disruptions in transportation, communication, demand, information technology or supply, including strikes, acts of God, wars, terrorist activities and natural or man-made disasters;
- legal, tax, accounting or regulatory changes (including changes in import/export regulations and tariffs) or changes in the interpretation or enforcement of existing requirements;
- changes in our estimated tax rate; and
- foreign currency exchange rate fluctuations.

The COVID-19 pandemic has impacted, and could further impact, many of these factors.

We serve constantly evolving industries, and any failure to manage our business effectively during periods of rapid change may adversely affect our business performance and results of operations.

Intense competition in the semiconductor industry often leads to rapid changes in products and technology. These changes, along with shifts in demands for semiconductors, can significantly alter demand for our products; the amount and mix of customers' spending on our products can significantly impact our results of operations. Changes in demand may arise from factors such as advances in fabrication processes, new and emerging technologies, end-user demand, customers' production capacity and customers' capacity utilization. We must accurately forecast demand for each of our products and effectively manage our resources and production capacity across our various businesses. Although we regularly reassess our allocation of resources in response to the changing business environment, we may incur unexpected or additional costs to align our operations with demand. If we do not adequately anticipate changes in our business environment, we may lack the infrastructure, manufacturing capacity and resources to scale up our business to meet customer expectations and compete successfully during a period of growth, or we may expand our capacity too rapidly, resulting in excess fixed costs.

Our ability to increase sales of our products, particularly our capital equipment products, depends in part upon our ability, in a very short timeframe, to ramp up our manufacturing capacity and to mobilize our supply chain. If we are unable to expand our manufacturing capacity on a timely basis, manage the expansion effectively and obtain larger quantities of raw materials, our customers could obtain products from our competitors, which would reduce our market share, harm our reputation as a trusted partner and impact our results of operations. These challenges have been and may continue to be exacerbated by the COVID-19 pandemic. In 2022, we continued to face instances where our manufacturing capacity or supply chain was constrained and the lead time to manufacture and deliver our customers' products was extended. If we are unable to meet our customers' demand for our products or deliver our products within our customers' required lead times, our customers may seek to replace us with alternative suppliers. Additionally, in the last two years, we have seen increased inventory levels in a challenging supply chain environment. Failure to adjust our inventory to more normalized levels may lead to an increased risk of excess and obsolete inventory and harm our cash flow.

Interruptions in our supply chain, including our single and limited source suppliers, could affect our ability to manufacture our products, meet demand, increase costs and have an adverse effect on our revenue results of operations.

Our supply chain is critical to the supply of our products and solutions to meet the quality, demand and technology requirements our customers. We rely on the timely delivery of parts, materials and services, including components and subassemblies, from our suppliers and contract manufacturers. Alternative sources to mitigate the risk that the failure of any single provider or supplier will adversely affect our business are not feasible in all circumstances. For example, we rely on single or limited source suppliers for certain raw materials that are critical to the manufacturing of our products, such as plastic polymers, filtration membranes, abrasive particles, petroleum coke and other materials. If we were to lose any one of these or other critical sources, or there is an industry-wide increase in demand for, or the discontinuation of, raw materials used in our products, it could be difficult for us, or we may be unable, to find an alternative supplier or raw material, in which case our operations could be adversely affected. When these events occur, we work proactively and collaboratively with the supplier to solve the manufacturing issue in order to reestablish the supply of these materials or find alternative materials and work with our customers through their vigorous qualification process.

Demand for semiconductors, electronic products, and other factors, such as the COVID-19 pandemic and the conflict in Ukraine, have resulted in, and may continue to result in, a shortage of raw materials and components needed to manufacture and deliver our products, as well as increased costs and risks associated with qualifying products that are manufactured using new raw materials and delays in and unpredictability of shipments due to transportation interruptions, all of which could harm our reputation or the competitiveness of our products. Such shortages, delays and unpredictability have adversely impacted, and may continue to adversely impact, our suppliers' ability to meet our demand requirements, have adversely impacted, and may continue to adversely impact, our manufacturing operations and our ability to meet customer demand and have impacted in the past, and may impact in the future, our gross margins and our other operating results. Our actions to counteract adverse impacts

to our gross margins and other operating results, could be unsuccessful, or could have the effect of reducing demand, which would adversely impact our revenue. Additionally, our suppliers may not have the capacity to meet increases in our demand for raw materials, in turn, making us unable to meet demand from our customers. If our suppliers or sub-suppliers are unable to maintain their operations, due to operational restrictions or financial hardship caused by an economic slowdown or recession, we may increase our safety stocks of raw materials or components or alter our payment terms with such suppliers, including prepaying for raw materials, which could put downward pressure on our cash flow.

The COVID-19 pandemic and continuing governmental responses has and could materially adversely affect our financial condition and results of operations.

The COVID-19 pandemic has had, and continues to have, an impact on the global economy and continues to cause macroeconomic uncertainty. Governmental authorities around the globe implemented, and may again in the future implement, numerous and evolving measures in response to the virus. Although countries around the world largely reopened in 2022, there remains significant uncertainty in certain jurisdictions, most notably, China. Any future constraints, limitations or modifications imposed on our operations or business practices, or those of our suppliers, may limit our ability to meet customer demand, cause us to increase our safety stock of certain materials, reduce our productivity, slow or diminish our research and development activities, make our products less competitive, or cause our customers to seek alternative suppliers and delay customer qualification activities, any of which could harm our business, reduce our profitability or have a material adverse effect on our financial condition and results of operations. The degree to which COVID-19 impacts our results will depend on future developments, which are highly uncertain and cannot be predicted, including, but not limited to, the duration and spread of any future outbreaks, their severity, potential additional waves of infection, the emergence of more virulent or more dangerous strains of the virus, the actions to mitigate the virus and its impact, the development, distribution, efficacy and acceptance of vaccines, and how quickly and to what extent normal economic and operating conditions can resume.

We are exposed to the risks of operating a global business, as a significant amount of our sales and manufacturing activity occur outside the United States.

Sales to customers outside the United States accounted for approximately 76%, 77% and 75% of our net sales in 2022, 2021 and 2020, respectively. We anticipate that international sales will continue to account for a majority of our net sales. In addition, a number of our key domestic customers derive a significant portion of their revenues from sales in international markets. We also manufacture a significant portion of our products outside the United States and depend on international suppliers for many of our parts and raw materials. We intend to continue to pursue opportunities in both sales and manufacturing internationally. Our international operations are subject to a number of risks and potential costs that could adversely affect our revenue and profitability, including:

- global trade issues and changes in and uncertainties with respect to trade and export regulations, trade policies and sanctions, tariffs, and international trade disputes, including new and changing export regulations for certain exports to China, where we have significant business, and any retaliatory measures, which could impose additional costs on our operations and limit our ability to operate our business and which could adversely impact us, our customers or our suppliers;
- positions taken by governmental agencies regarding possible national, commercial and/or security issues posed by the development, sale or export of certain products and technologies;
- geopolitical tensions or conflicts, such as Russia's invasion of Ukraine or increasing tensions with China, political and economic instability and uncertainty, which may result in severely diminished liquidity and credit availability, rating downgrades of sovereign debt, declining valuation of certain investments, declines in consumer confidence, declines in economic growth, volatility in unemployment rates and uncertainty about economic stability;
- challenges in hiring and integrating workers in different countries;
- challenges in managing a diverse workforce with different experience levels, languages, cultures, customs, business practices and worker expectations, along with differing employment practices and labor issues;
- challenges of maintaining appropriate business processes, procedures and internal controls and complying with legal, environmental, health and safety, anti-bribery, anti-corruption and other regulatory requirements that vary by jurisdiction;
- challenges in developing relationships with local customers, suppliers and governments;
- fluctuating pricing and availability of raw materials and supply chain interruptions or slowdowns, including as a result of difficulties, financial or otherwise, faced by segments of the transportation industry;

- public health crises, such as the COVID-19 pandemic, and related implications thereof;
- expense and complexity of complying with U.S. and foreign import and export regulations, including the ability to obtain required import and export licenses;
- fluctuations in interest rates and currency exchange rates, including the relative strength or weakness of the U.S. dollar against foreign currencies that are important to our business, including the Japanese yen, euro, Taiwanese dollar, Korean won, Chinese renminbi, Singapore dollar, Malaysian ringgit, Canadian dollar or Israeli shekel, which could cause our sales and profitability to decline;
- liability for foreign taxes assessed at rates higher than those applicable to our domestic operations;
- challenges and costs associated with the protection of our intellectual property throughout the world; and
- customer or government efforts to encourage operations and sourcing in a particular country, such as Korea or China, including efforts to develop and grow local competitors, require local manufacturing, and provide special incentives to government-backed local customers to buy from local competitors.

In the past, these factors have disrupted our operations and increased our costs, and we expect that these factors will continue to do so in the future. Furthermore, there is inherent risk, based on the complex relationships among China, Japan, Korea, Taiwan, and the United States, that political, diplomatic and national security influences could lead to trade disputes, impacts and/or disruptions, in particular those affecting the semiconductor industry. This can adversely affect our business with China, Japan, Korea, and/or Taiwan and perhaps the entire Asia Pacific region or global economy. A significant trade dispute, impact and/or disruption in any area where we do business could have a materially adverse impact on our future revenue and profits.

Tariffs, export controls and other trade laws and restrictions resulting from international trade disputes, strained international relations and changes to foreign and national security policy, especially as they relate to China, could have an adverse impact on our operations and reduce the competitiveness or availability of our products relative to local and global competitors.

Tariffs, additional taxes, trade barriers and other measures, particularly those arising out of relations between the United States and China, may increase costs of raw materials and our manufacturing costs, decrease margins, reduce the competitiveness of our products or inhibit our ability to sell products or purchase necessary equipment and supplies, any of which could have a material adverse effect on our business, results of operations or financial condition. For example, both the United States and China have implemented several rounds of tariffs and retaliations with respect to certain products imported from the other country, some of which have impacted certain raw materials we use. Our operational changes in an effort to mitigate the impact of these tariffs on our products may not be successful.

In addition, we are subject to export control and economic sanctions laws and regulations that restrict the delivery of some of our products and services to certain end users, countries and nationals of certain countries. In certain circumstances, these restrictions may prohibit the transfer of certain of our products, services and technologies, and in other circumstances they may require us to obtain a license from the U.S. government before delivering the controlled item or service. Obtaining export licenses may be difficult, costly and time-consuming, and there is no assurance that we will be issued licenses that we apply for on a timely basis or at all. We must also comply with export control and economic sanctions laws and regulations imposed by other countries. Our export and trade control compliance program may be ineffective or circumvented, exposing us to legal liabilities. Compliance with these laws could significantly limit our sales in the future. Changes in, and responses to, U.S. trade controls could reduce the competitiveness of our products and cause our sales to drop, which could have a material adverse effect on our business, financial condition and results of operations.

Over the last several years, the U.S. government has significantly expanded export controls on certain technologies and commodities to certain markets, particularly with respect to semiconductor and other high technology exports to China. For example, on October 7, 2022, the U.S. Commerce Department of Commerce, Bureau of Industry and Security (“BIS”) announced new export control regulations that restrict the sale of certain products and services to some companies and domestic fabs in China. Additionally, effective June 29, 2020, the U.S. Department of Commerce imposed new export controls on the transfer of many U.S. products and technologies, including many commercial-grade electronics, to “military end users” in China, a term which may include many Chinese commercial companies that sell products to or do business with the military. These and other regulations have reduced our ability to sell our products to customers in China and it is possible future regulation could further reduce demand for our products. As a result of these restrictive measures, certain of our customers have made efforts to source products domestically in order to mitigate perceived risks to their supply chain. If these efforts are successful, are widespread amongst our customers and expand to our products and solutions broadly, overall global demand for our customers’ products or for other products produced or manufactured in the United States or based on U.S. technology may

be reduced, in turn reducing demand for our products, which could have a material adverse effect on our business, financial condition and results of operations. Furthermore, government authorities may take retaliatory actions, impose conditions that require the use of local suppliers or partnerships with local companies, or require the license or other transfer of intellectual property, which could have a significant adverse impact on our business. Such risks may be especially exacerbated as they relate to China, a market that is important to our business, representing approximately 15% of our sales in 2022.

A significant portion of our sales is concentrated on a limited number of key customers, and our net sales and profitability may materially decline if we were to lose one or more of these customers.

Sales to a limited number of large customers constitute a significant portion of our overall revenue, shipments, cash flows, collections and profitability. Our top ten customers accounted for 43%, 43% and 46% of our net sales in 2022, 2021 and 2020, respectively. Our customers could stop using our products in their manufacturing processes with limited advance notice to us, and we would have limited or no contractual recourse. The cancellation, reduction or deferral of purchases of our products by any one of these customers could significantly reduce our revenues in any particular quarter. If we were to lose any of our significant customers, if our products are not specified for our significant customers' products or if we suffer a material reduction in their purchase orders, our revenue could decline and our business, financial condition and results of operations could be materially and adversely affected. Due to the long design and development cycle and lengthy customer product qualification periods required for most of our products, we may be unable to replace these customers quickly, if at all. In addition, our principal customers hold considerable purchasing power and may be able to negotiate sales terms that result in decreased pricing, increased costs, and/or lower margins for us, and limitations on our ability to share jointly developed technology with others. The semiconductor industry may continue to undergo consolidation, and if any of our customers merge or are acquired, we may experience lower overall sales to the merged or combined companies.

Our customer base is also geographically concentrated, particularly in Taiwan, Korea, Japan, China and the United States. As a result, export regulations or other trends that apply to customers in certain countries, such as those in China, have exposed and may further expose our business and results of operations to greater volatility. The geographic concentration of our customer base could shift over time as a result of government policy and incentives to develop regional semiconductor industries.

If we are unable to anticipate and respond to rapid technological change and customer requirements by continuing to innovate and introduce new and enhanced products and solutions, our business could be seriously harmed.

The semiconductor industry is subject to rapid technological change, changing customer requirements and frequent new product introductions. In our industry, the first company to introduce an innovative product that addresses an identified market need will often have a significant advantage over competing products. For this reason, we make significant expenditures to research, develop, engineer and market new products and make significant capital investments in technology and manufacturing capacity in anticipation of future business and without any purchase commitment from our customers. We incurred \$229.0 million, \$167.6 million and \$136.1 million for engineering, research and development expense in 2022, 2021 and 2020, respectively, to support new product and technology development. In addition, we have been investing significantly in our manufacturing footprint, such as our KSP facility in Taiwan and our newly announced planned facility in Colorado Springs, to meet anticipated demand for our products. Following development, it may take several years for sales of a new product to reach a substantial level of sales, if ever. If a product concept does not progress beyond the development stage or only achieves limited acceptance in the marketplace, we may not receive a direct return on our expenditures, we may lose market share and our revenue and our profitability may decline. For example, in the past, we incurred significant impairment charges for capital expenditures related to developing the capability to manufacture shippers and FOUPs for 450 mm wafers, which major semiconductor manufacturers announced that they would not initiate manufacturing for in the foreseeable future.

We believe that our future success will depend upon our ability to continue to develop mission-critical solutions to maximize our customers' manufacturing yields and enable higher performance semiconductor devices. A failure to successfully anticipate and respond to technological changes by developing, marketing and manufacturing new products or enhancements to our existing products could harm our business prospects and significantly reduce our sales. For example, as 3D NAND technology advances to higher densities, the conventional process used to etch critical features no longer works. Recognizing the need for a new chemistry, we developed a series of prototype formulations for highly selective nitride etch and developed a specialized liquid filter that removes contaminants while simultaneously maintaining the critical components that make the chemistry function. While we have achieved process-of-record for these specific etch processes with certain customers and we are preparing for rapid, high-volume ramp, we may not generate significant revenue from these solutions. We cannot assure you that the new products and technology we choose to develop and market will be successful. In addition, if new products have reliability or quality problems, we may experience reduced orders, higher manufacturing costs, delays in acceptance and payment, additional service and warranty expense and damage to our reputation.

Competition from new or existing companies could harm our financial condition, results of operations and cash flow.

We operate in a highly competitive industry. We face many competitors, some of which have substantially greater manufacturing, financial, research and development and marketing resources than we do. In addition, some of our competitors may have better-established customer relationships than we do, which may enable them to have their products specified for use more frequently and more quickly by these customers. We also face competition from smaller, regional companies that focus on serving customers in their regions. Further, customers continually evaluate the benefits of internal manufacturing versus outsourcing, and a customer's decision to internally manufacture products that we provide may negatively impact us. If we are unable to maintain our competitive position, we could experience downward pressure on prices, fewer customer orders, reduced margins, the inability to take advantage of new business opportunities and a loss of market share, any of which could have a material adverse effect on our results of operations. Further, we expect that existing and new competitors will improve their products and introduce new products with enhanced performance characteristics. The introduction of new products or more efficient production of existing products by competitors could diminish our market share and increase pricing pressure on our products.

We may acquire other businesses, form joint ventures or divest businesses, any of which could negatively affect our financial performance.

We intend to continue to engage in business combinations, acquisitions, joint ventures, investments, divestitures or other types of collaborations to address gaps in our product offerings, adjust our business and product portfolio to meet our ongoing strategic objectives, diversify into complementary markets, increase our scale or accomplish other strategic objectives. These transactions involve numerous risks to our business, financial condition and operating results, including but not limited to:

- experiencing difficulty in identifying suitable acquisition candidates and completing transactions at appropriate valuations, in a timely manner, on a cost-effective basis or at all, due to substantial competition for acquisition targets;
- inability to successfully integrate any acquired businesses into our business operations;
- failure to realize the anticipated synergies or other benefits of any such transaction;
- entering into markets in which we have limited or no prior experience;
- finding acquirors and obtaining adequate value for businesses that no longer meet our objectives;
- inability to complete proposed or pending transactions due to factors such as the failure or inability to obtain regulatory or other approvals;
- requirements imposed by government regulators in connection with their review of a transaction, which may include, among other things, divestitures and restrictions on the conduct of our existing business or the acquired business;
- undertaking multiple transactions at the same time in order to take advantage of acquisition or divestiture opportunities that do arise, which could strain our ability to effectively execute and integrate such transactions;
- diversion of management's attention from our day-to-day business due to dedication of significant management resources to such transactions;
- employee uncertainty and lack of focus during the integration process that may also disrupt our business;
- the risk of litigation or claims associated with a proposed or completed transaction;
- challenges associated with managing new, more diverse and more widespread operations, projects and people, potentially located in regions where we have not historically conducted or operated our business;
- dependence on unfamiliar or less secure supply chains and inefficient scale of the acquired entity;
- increasing costs of performing due diligence to meet the expectations of investors and government regulators;
- despite our due diligence, we could assume unknown, underestimated or contingent liabilities, such as potential environmental, health and safety liabilities, any of which could lead to costly litigation or mitigation actions;
- an acquired technology or product may have inadequate or invalid intellectual property protection or may be subject to claims of infringement by a third party, which may result in claims for damages and lower than anticipated revenue;
- we could experience negative effects on our reported results of operations from dilutive results from operations and/or from future potential impairment of acquired assets, including goodwill, related to acquisitions;
- an acquired company may have inadequate or ineffective internal controls over financial reporting, disclosure controls and procedures, cybersecurity, privacy, environmental, health and safety, anti-bribery, anti-corruption, human resource or other policies or practices, which may require unexpected or additional integration, mitigation and remediation costs;

- reductions in cash or increases in debt to finance transactions, which reduce the cash flow available for general corporate or other purposes, including share repurchases and dividends; and
- difficulties in retaining key employees or customers of an acquired business.

Manufacturing interruptions or delays, or other disruptions to our operations, could adversely affect our business, financial condition and results of operations.

Our manufacturing processes are complex and require the use of expensive and technologically sophisticated equipment and materials. These processes are frequently modified to improve manufacturing yields, process stability and product quality. We have, on occasion, experienced manufacturing difficulties, such as critical equipment breakdowns or the introduction of impurities in the manufacturing process. Any future difficulties could cause lower yields, make our products unmarketable and/or delay deliveries to customers. In addition, any modification to the manufacturing process of a product could require that the product be re-qualified by customers, which can increase our costs and delay our ability to sell this product to our customers. These and other manufacturing difficulties may result in the loss of sales and exposure to warranty and product liability claims.

Some of our products are manufactured at only one or two facilities in different countries, many of which are subject to severe weather events and natural catastrophes, such as typhoons in Taiwan, Malaysia and China, earthquakes in Japan and Taiwan, hurricanes in east Texas and Florida, severe winter weather in Texas, wildfires in California and Colorado and flooding in Arkansas. Our suppliers and customers face similar dangers. Our continuity plans designed to mitigate the impact of natural disasters on our operations may be insufficient, and any catastrophe may disrupt our ability to manufacture and deliver products to our customers, resulting in an adverse impact on our business and results of operations. A disruption at our manufacturing facilities could impact sales of the products manufactured at those facilities until another facility could commence or expand production of those products, and disruptions at our other facilities may similarly adversely affect our operations. In addition to natural disasters, disruptions may be caused by other factors, including civil unrest, outbreaks of disease, terrorist actions or other events outside our control. We have moved, and we may again move, the manufacture of certain products from one plant to another. If we fail to transfer and re-establish the manufacturing processes in the destination plant efficiently and effectively, we may not be able to meet customer demand, we may lose credibility with our customers and our business may be harmed. Even if we successfully move our manufacturing processes, we may not achieve the anticipated levels of cost savings or efficiencies, if any.

Our operations use hazardous materials that expose us to various risks, including potential liability for personal injury and potential remediation obligations.

Our operations involve, and we are exposed to the risks associated with, the use and manufacture of hazardous materials. In particular, we manufacture specialty chemicals, which is an inherently hazardous process that may result in accidents, and store and transport hazardous raw materials, products and waste in, to and from various facilities. Potential risks that may disrupt our operations or expose us to significant losses and liabilities include explosions and fires, chemical spills and other discharges, releases of toxic or hazardous substances or gases, and pipeline and storage tank leaks and ruptures. These and other hazards may result in liability for personal injury, death, damage to property and contamination of the environment; suspension of operations; the imposition of civil or criminal fines, penalties and other sanctions; cleanup costs; claims by governmental entities or third parties; reputational harm; increases in our insurance costs; and other adverse impacts on our results of operations. Moreover, a failure of one of our products at a customer site could interrupt the business operations of the customer. For example, while we believe that our SDS and VAC delivery systems are safe to transport, store and deliver toxic gases, any leakage could cause serious damage, including injury or death, to any person exposed to those toxic gases, potentially creating significant product liability exposure for us. Our insurance coverage may be inadequate to satisfy any such liabilities, and our financial results or financial condition could be adversely affected.

Loss of any of our key personnel could harm our business, and our inability to attract and retain new qualified personnel could inhibit our ability to operate and grow our business successfully.

Many of our key personnel have significant experience in the semiconductor industry and deep technical expertise. The loss of the services of any of our key employees or an inability to attract, train and retain qualified and skilled employees, particularly research and development and engineering personnel, could inhibit our ability to operate and grow our business. As the semiconductor industry has grown in recent years, competition for qualified talent, particularly those with significant industry experience, has intensified. During 2022, we experienced, and may in the future continue to experience, an increasingly competitive and constrained labor market, which may limit our ability to add headcount required to meet our customers' demand, decrease our productivity due to an influx of inexperienced workers and cause our labor costs to increase and our

profitability to decline. As a result, the difficulty and costs associated with attracting and retaining employees has risen and may continue to rise.

If we fail to obtain, protect and enforce intellectual property rights, our business and prospects could be harmed.

Our future success and competitive position depend in part upon our ability to obtain, maintain and enforce intellectual property rights. We rely on patent, trade secret and trademark laws to protect many of our major product platforms. Although we often file applications for additional patents, our pending applications may not be approved. Moreover, any patents that we own or obtain may not provide us with any competitive advantage, may be designed around and these patents may expire or be challenged, invalidated, circumvented, rendered unenforceable or otherwise compromised by third parties. In addition, any failure to obtain intellectual property protection in the international jurisdictions we serve could expose us to increased competition, which could limit our growth and future revenue. The confidentiality agreements we enter into with our employees and certain third parties to protect our proprietary information and technology may be inadequate to protect our interests, and the remedies available to us for any breach may not adequately mitigate any breach or our confidential and proprietary information and technology may be replicated or obtained through lawful means. Additionally, we may lose trade secret protection as a result of the actions or omissions by us, our employees or third parties. Any weakness in our ability to protect our intellectual property could adversely affect our business, financial condition and results of operations.

Third parties may misappropriate our intellectual property rights, and disputes regarding intellectual property rights may arise. We may bring litigation in order to enforce our patents, copyrights or other intellectual property rights, to protect our trade secrets, to determine the validity and scope of the proprietary rights of others or to defend against claims of infringement. Such litigation could result in substantial costs, diversion of resources, require us to pay damages or royalties, require us to alter our products or processes, or require us to obtain a license, which we may be unable to do on commercially acceptable terms, or at all, to continue selling the impacted product, and could negatively affect our sales, profitability and prospects. From 2015 until 2020, we were party to litigation to enforce our intellectual property rights against Gudeng Precision Industrial Co., Ltd. for their patent infringement. We settled this dispute in 2020 by licensing certain of our intellectual property rights to Gudeng. In 2021, Gudeng filed a patent lawsuit against us, and the lawsuit is pending. We are party to ongoing litigation with Dupont relating to claims that certain Dupont products infringe on certain of our CMP slurry patents. We continue to vigorously defend and enforce our patents and rights, which will cause us to incur costs. We may initiate other costly litigation against our competitors or other third parties in order to protect our intellectual property rights. We cannot predict how any existing or future litigation will be resolved or what impact it may have on us.

We may be subject to information technology system failures, network disruptions and breaches in data security, which could damage our reputation and adversely affect our financial condition, results of operations and cash flows, and new laws and regulations regarding data privacy may increase our costs.

We collect and store sensitive data, including our financial information, intellectual property, confidential information, proprietary business information and personally identifiable information of our employees and others, as well as similar information of our customers, suppliers and business partners. We maintain this information in our data centers, on our networks and on information technology, or IT, systems owned and maintained by third parties. The secure processing, maintenance and transmission of this information is critical to our operations. All IT systems are subject to disruption, breach or failure. Data breaches, including those sponsored by state actors, have become increasingly common in recent years. For example, during 2020, the United States government was hacked via third-party software applications by hackers suspected of being sponsored by a foreign intelligence agency. We and our third-party suppliers have experienced, and expect to continue to be subject to, cybersecurity threats and incidents ranging from employee error or misuse, to individual attempts to gain unauthorized access to systems, to sophisticated and targeted measures known as advanced persistent threats. Despite the precautions we and our third-party providers undertake, IT system failures, network disruptions and breaches of data security could cause disruption in our operations, issues with customer communication and order management, the unauthorized or unintentional disclosure of sensitive information, disruptions in our transaction processing or undermine the integrity of our disclosure controls and procedures and our internal control over financial reporting, which could affect our reputation, result in significant liabilities and expenses, adversely affect our ability to report our financial results in a timely manner and could have a material adverse effect on our financial condition, results of operations and cash flows. These risks may be further amplified by the increased reliance on remote access to IT systems by us and our customers, suppliers and other third parties as a result of employees working remotely in response to the COVID-19 pandemic.

Moreover, new laws and regulations, such as the European Union's General Data Protection Regulation, the California Consumer Privacy Act and China's Personal Information Protection Law, add to the complexity of our compliance obligations,

which increases our compliance costs. Although we have established internal controls and procedures intended to achieve compliance with such laws and regulations, a failure to fully comply could result in significant penalties.

Climate change may have a long-term impact on our business.

There are inherent climate-related risks wherever our business is conducted. Changes in market dynamics, stakeholder expectations, local, national and international climate change policies, and the frequency and intensity of extreme weather events on critical infrastructure in the United States and abroad, all have the potential to disrupt our business and operations. Such events could result in a significant increase in our costs and expenses and harm our future revenue, cash flows and financial performance. Global climate change is resulting in, and may continue to result, in certain natural disasters and adverse weather events, such as drought, wildfires, storms, sea-level rise and flooding, occurring more frequently or with greater intensity, which could cause business disruptions and impact employees' abilities to commute or to work from home effectively.

Our environmental, social and governance commitments could result in additional costs, and our inability to achieve them could have an adverse impact on our reputation and performance.

From time to time we communicate our strategies, commitments and targets related to sustainability, carbon emissions, diversity and inclusion, human rights, and other environmental, social and governance matters. These strategies, commitments and targets reflect our current plans and aspirations, and we may be unable to achieve them. Changing customer sustainability requirements, as well as our sustainability targets, could cause us from time to time to alter our manufacturing, operations or products, and incur substantial additional expense to meet such requirements and targets. Any failure to meet these sustainability requirements or targets could adversely impact the demand for our products and subject us to significant costs and liabilities and reputational risks that could adversely affect our business, financial condition and results of operations. In addition, standards and processes for measuring and reporting carbon emissions and other sustainability metrics may change over time, and may result in inconsistent data, or could result in significant revisions to our strategies, commitments and targets, or our ability to achieve them. Any scrutiny of our carbon emissions or other sustainability disclosures or our failure to achieve related strategies, commitments and targets could negatively impact our reputation or performance.

Risks Related to Our Acquisition of CMC Materials

Combining our businesses and those of CMC may be more difficult, costly or time-consuming than expected and we may fail to realize the anticipated benefits of the acquisition, which may adversely affect our business results and negatively affect the value of our common stock following the acquisition.

The success of the acquisition will depend, in part, on our ability to realize anticipated benefits from integrating CMC into the Company. To realize these anticipated benefits, our businesses and those of CMC must be successfully combined. If we are not able to achieve these objectives, the anticipated benefits of the acquisition may not be realized fully or at all, or may take longer to realize than expected. An inability to realize the full extent of the anticipated benefits of the acquisition and the other transactions contemplated by the merger agreement, as well as any delays encountered in the integration process, could have an adverse effect upon our revenues, level of expenses and operating results, which may adversely affect the value of our common stock. Moreover, the actual integration may result in additional and unforeseen expenses, and the anticipated benefits of the integration plan may not be realized. Actual growth and cost savings, if achieved, may be lower than what we expect and may take longer to achieve than anticipated.

It is possible that the integration process could result in the loss of customers, the disruption of either company's or both companies' ongoing businesses, inconsistencies in standards, controls, procedures and policies, unexpected integration issues, higher than expected integration costs and an overall integration process that take longer than originally anticipated. Specifically, the following issues, among others, must be addressed in integrating our operations and those of CMC in order to realize the anticipated benefits of the acquisition:

- combining the companies' operations and corporate functions;
- combining the companies' businesses and meeting our capital requirements following the acquisition, in a manner that permits us to achieve any cost savings or revenue synergies anticipated to result from the acquisition, the failure of which would result in the anticipated benefits of the acquisition not being realized in the time frame currently anticipated or at all;
- integrating personnel from the two companies;

- integrating the companies' technologies;
- integrating and unifying the offerings and services available to customers;
- identifying and eliminating redundant and underperforming functions and assets;
- harmonizing the companies' operating practices, employee development and compensation programs, internal controls and other policies, procedures and processes;
- maintaining existing agreements with customers, distributors, providers and vendors and avoiding delays in entering into new agreements with prospective customers, distributors, providers and vendors;
- addressing possible differences in business backgrounds, corporate cultures and management philosophies;
- consolidating the companies' administrative and information technology infrastructure;
- coordinating distribution and marketing efforts;
- managing the movement of certain positions to different locations; and
- coordinating geographically dispersed organizations.

In addition, at times, the attention of management and our resources may be focused on completion of business integration and diverted from day-to-day business operations or other opportunities that may have been beneficial to us, which may disrupt our ongoing business.

Risks Related to Government Regulation

We are subject to a variety of environmental laws and regulations that could cause us to incur significant liabilities and expenses.

Failure to comply with the wide variety of federal, state, local and non-U.S. regulatory requirements relating to the release, use, storage, treatment, transportation, discharge, disposal and remediation of, and human exposure to, hazardous chemicals could result in future liabilities or the suspension of production or shipment. These requirements have become stricter over time. These laws and regulations, among others, increase the complexity and costs of transporting our products from the country in which they are manufactured to our customers. Further changes to these and similar regulations could restrict our ability to expand, build or acquire new facilities, require us to acquire costly control equipment, cause us to incur expenses associated with remediation of contamination, cause us to modify our manufacturing or shipping processes or otherwise increase our cost of doing business and have a negative impact on our financial condition, results of operations and cash flows. In addition, the potential adoption of new laws, rules or regulations related to climate change poses risks that could harm our results of operations or affect the way we conduct our businesses. For example, new or modified regulations could require us to make substantial expenditures to enhance our environmental compliance efforts.

We are exposed to various risks from our regulatory environment.

We are subject to risks related to new, different, inconsistent, or even conflicting laws, rules, and regulations that may be enacted by legislative or executive bodies and/or regulatory agencies in the countries where we operate; disagreements or disputes related to international trade; and the interpretation and application of laws, rules, and regulations. As a public company with global operations, we are subject to the laws of multiple jurisdictions and the rules and regulations of various governing bodies, including those related to health and safety, export controls, financial and other disclosures, corporate governance, privacy, anti-corruption, such as the Foreign Corrupt Practices Act and other local laws prohibiting corrupt payments to governmental officials or customers, conflict minerals or other social responsibility legislation, employment practices, immigration or travel regulations and antitrust regulations, among others. Each of these laws, rules and regulations imposes costs on our business, including financial costs and potential diversion of our management's attention, and may present risks to our business, including potential fines, restrictions on our actions and reputational damage if we do not fully comply. The volume of changes to such laws, rules and regulations may increase in the United States over the next several quarters as the Biden administration continues to implement its policies.

To maintain high standards of corporate governance and public disclosure, we intend to invest in appropriate resources to comply with evolving standards. Changes in or ambiguous interpretations of laws, regulations and standards may create uncertainty regarding compliance matters. Efforts to comply with new and changing regulations have resulted in, and are likely to continue to result in, increased administrative expenses and diversion of management's time and attention from revenue-generating activities to compliance activities. If we are found by a court or regulatory agency not to be in compliance with laws and regulations, our reputation, business, financial condition and/or results of operations could be adversely affected, we may

be disqualified or barred from participating in certain activities and we may be forced to modify our operations to achieve full compliance.

Changes in taxation or adverse tax rulings could adversely affect our results of operations.

We operate in many foreign countries and are subject to taxation at various rates and audit by multiple taxing authorities. Our results of operations could be affected by tax audits, changes in tax rates, changes in laws and regulations governing the calculation, location and taxation of earned profit, changes in laws and regulations affecting our ability to realize deferred tax assets on our balance sheet and changes in laws and regulations relating to the repatriation of cash into the United States. Each quarter we forecast our tax liability based on our forecast of our performance for the year in each tax jurisdiction. If our performance forecast changes, our forecasted tax liability would also likely change, perhaps materially.

We have undertaken and expect to continue to undertake a number of complex internal reorganizations of our foreign subsidiaries in order to rationalize and streamline our foreign operations, focus our management efforts on certain local opportunities and take advantage of favorable business conditions in certain localities. These or any future reorganizations could result in adverse tax consequences in one or more jurisdictions, which could adversely impact our profitability from foreign operations and result in a material reduction in our results of operations.

Various other jurisdictions, including members of the Organization for Economic Cooperation and Development, are considering changes to their tax laws, including provisions intended to address base erosion and profit shifting by taxpayers. Any tax reform adopted in these or other countries may exacerbate the risks described above.

Risks Related to Our Indebtedness

We have a substantial amount of indebtedness and may in the future incur substantially more debt, each of which could adversely affect our ability to obtain financing in the future and react to changes in our business.

As of December 31, 2022, we had an aggregate principal amount of \$5.9 billion of indebtedness outstanding, including the \$2,495 million from our senior secured term loan facility due 2029, or the Term Loan Facility, \$1.6 billion aggregate principal amount of the 4.75% senior secured notes due April 15, 2029, \$895 million aggregate principal amount of the 5.95% senior unsecured notes due June 15, 2030, our 4.375% senior unsecured notes due April 15, 2028, our 3.625% senior unsecured notes due May 1, 2029, or collectively the Notes, and our bridge credit facility due 2023, or the Bridge Credit Facility. In addition, we have approximately \$575 million of unutilized capacity under our senior secured revolving credit facility due 2027, or the Revolving Facility. We refer to the Term Loan Facility, and the Revolving Facility as the Senior Secured Credit Facilities, the Senior Secured Credit Facilities and the Bridge Credit Facility as the Credit Facilities and the credit agreements that govern the Credit Facilities as the Credit Agreements. Further, we may incur significant additional secured and unsecured indebtedness in the future.

Although the indentures governing the Notes, or the Indentures, and the Credit Agreements restrict our ability to incur additional indebtedness, the restrictions have a number of significant qualifications and exceptions. For example, the credit agreement governing our Senior Secured Credit Facilities, or the Amended Credit Agreement, provides that we can request additional loans and commitments up to the greater of \$1,100 million or 100% of our EBITDA, as well as additional amounts if our secured net leverage ratio is less than a specified ratio. Further, these restrictions do not prevent us from incurring monetary obligations that do not constitute indebtedness. If we add new indebtedness and other monetary obligations to our current debt levels, the related risks that we now face would intensify.

Our debt could have important consequences, including:

- limiting our ability to obtain additional financing to fund future working capital, capital expenditures, acquisitions or other general corporate purposes;
- requiring a substantial portion of our cash flow to be dedicated to debt service payments instead of other purposes;
- increasing our vulnerability to adverse changes in general economic, industry and competitive conditions;
- exposing us to increased interest expense for borrowings with variable interest rates, including borrowings under the Credit Facilities; and
- placing us at a disadvantage compared to other, less leveraged competitors or competitors with comparable debt having more favorable terms.

We may be unable to generate sufficient cash to service our indebtedness and may be forced to take other actions, which may not be successful, to satisfy our obligations under our indebtedness.

We may be unable to maintain sufficient cash flow from operating activities to permit us to pay the principal of, premium, if any, and interest on our indebtedness. Our ability to make scheduled payments on or to refinance our debt obligations depends on our financial condition and operating performance and the condition of the capital markets, which are subject to prevailing economic, industry and competitive conditions, as well as many financial, business, legislative, political, regulatory and other factors beyond our control. If our cash flow and capital resources are insufficient to fund our debt service obligations, we could face substantial liquidity problems, be forced to reduce or delay investments and capital expenditures, dispose of material assets or operations, seek additional debt or equity capital or restructure or refinance our indebtedness, any of which could have a material adverse effect on our business, financial position and results of operations. In addition, the level and quality of our earnings, operations, business and management, among other things, will impact the determination of our credit ratings. A decrease in the ratings assigned to us by the ratings agencies may negatively impact our access to the debt capital markets and increase our cost of borrowing. There can be no assurance that we will be able to obtain any future required financing on acceptable terms or at all. In addition, there can be no assurance that we will be able to maintain the current credit worthiness or prospective credit rating of the Company. Any actual or anticipated changes or downgrades in such credit rating may have a negative impact on our liquidity, capital position or access to capital markets.

Any refinancing of our debt could be at higher interest rates and may require us to comply with more onerous covenants, which could further restrict our business operations. We may not be able to implement any refinancing on commercially reasonable terms or at all and, even if successful, a refinancing may not allow us to meet our scheduled debt service obligations. The agreements governing our indebtedness restrict our ability to dispose of assets and use the proceeds of such dispositions, and we may be unable to consummate any dispositions or generate proceeds sufficient to meet our debt service obligations.

If we cannot make scheduled payments on our debt, holders of the Notes and lenders under the Credit Facilities could declare all outstanding principal and interest to be due and payable, the lenders under the Revolving Facility could terminate their commitments to advance further loans, our secured lenders could foreclose against the assets securing their borrowings and we could be forced into bankruptcy or liquidation.

The terms of the Credit Agreements and the Indentures may restrict our operations, particularly our ability to respond to changes or raise additional funds.

The Amended Credit Agreement contains restrictive covenants that impose significant operating and financial restrictions that may limit our and our restricted subsidiaries' ability to take actions that may be in our long-term best interest, including restrictions on our and our restricted subsidiaries' ability to:

- incur additional indebtedness and guarantee indebtedness;
- pay dividends or make other distributions in respect of, or repurchase or redeem, capital stock;
- prepay, redeem or repurchase certain debt;
- make investments, loans, advances and acquisitions;
- engage in sale-leaseback or hedging transactions;
- create liens on, sell or otherwise dispose of assets, including capital stock of our subsidiaries;
- enter into transactions with affiliates;
- enter into agreements that restrict the ability to create liens, pay dividends or make loan repayments;
- alter the businesses we conduct; and
- merge or sell all or substantially all of our assets or incur a change of control in our capital stock ownership.

Also, the Indentures and the credit agreement governing our Bridge Credit Facility contain limited covenants, such as a covenant restricting our ability and certain of our subsidiaries' ability to incur certain debt secured by liens, engage in sale-leaseback and incur additional indebtedness by any restricted subsidiary.

In addition, the restrictive covenants under the credit agreement governing the Revolving Facility may, depending on the amount of revolving borrowings, unreimbursed letter of credit drawings and undrawn letters of credit, require us to maintain a secured net leverage ratio, which we may be unable to meet. Our failure to comply with these covenants could result in the acceleration of some or all of our indebtedness, which could lead to bankruptcy, reorganization or insolvency.

Risks Related to Owning our Common Stock

The price of our common stock has been and may remain volatile.

The price of our common stock has been volatile. In 2022, the closing price of our stock on The Nasdaq Global Select Market, or Nasdaq, ranged from a low of \$62.71 to a high of \$140.83, and, as in past years, the price of our common stock may show even greater volatility in the future. The trading price of our common stock is subject to significant volatility in response to numerous factors, many of which are beyond our control or may be unrelated to our operating results, including the following:

- the significant increase in volatility in the stock market as a result of the COVID-19 pandemic;
- any changes to our financial guidance, as well as potential decreased confidence in any guidance we do provide;
- changes in global economic conditions, including those resulting from trade tensions, rising inflation, and fluctuations in foreign currency exchange and interest rates;
- the failure to meet the expectations of securities analysts, which may vary significantly from our actual results;
- changes in financial estimates by securities analysts;
- press releases or announcements by, or changes in market values of, comparable companies;
- high volatility in price and volume in the markets for high-technology stocks;
- the public perception of equity values of publicly traded companies;
- fluctuations in our results of operations; and
- the other risks and uncertainties described in this Annual Report on Form 10-K and in our other filings with the SEC.

Fluctuations in our results of operations could cause our stock price to decline significantly. We believe that period-to-period comparisons of our results of operations may not be meaningful, and you should not rely upon them as indicators of our future performance. Future decreases in our stock price may adversely impact our ability to raise sufficient additional capital in the future, if needed.

There can be no assurance that we will continue to declare cash dividends or that we will recommence the repurchase of our shares in any particular amounts or at all.

Future payments of quarterly dividends and any future repurchases of shares of our common stock are subject to capital availability and periodic determinations by our board of directors that they are in the best interest of our stockholders and comply with all laws and applicable agreements. Future dividends and any future share repurchases may be affected by, among other factors, potential capital requirements for acquisitions and the funding of our research and development activities; legal risks; changes in federal and state income tax laws or corporate laws; contractual restrictions, such as financial or operating covenants in our debt arrangements; availability of domestic cash flow; and changes to our business model. The amounts of our dividend payments may change from time to time, and we may decide at any time to reduce, suspend or discontinue the payment of dividends or the repurchase of shares. A reduction, suspension or discontinuation of our dividend payments or the cessation of our share repurchase program could have a negative effect on the price of our common stock and may harm our reputation.

Provisions in our charter documents and Delaware law may delay or prevent an acquisition of us, which could decrease the value of our shares.

Our certificate of incorporation, our by-laws and Delaware law contain provisions that could make it harder for a third party to acquire us without the consent of our board of directors. These provisions include limitations on actions by written consent of our stockholders.

Our certificate of incorporation makes us subject to the anti-takeover provisions of Section 203 of the Delaware General Corporation Law. In general, Section 203 prohibits publicly held Delaware corporations from engaging in a “business combination” with an “interested stockholder” for a period of three years after the date of the transaction in which the person became an interested stockholder, unless the business combination is approved in a prescribed manner. This provision could discourage parties from bidding for our shares of common stock and could, as a result, reduce the likelihood of an increase in the price of our common stock that would otherwise occur if a bidder sought to buy our common stock.

Our certificate of incorporation authorizes our board of directors to issue, without further stockholder approval, up to 5,000,000 shares of preferred stock in one or more series and to fix and designate the rights, preferences, privileges and restrictions of the preferred stock, including dividend rights, conversion rights, voting rights, redemption rights and liquidation preferences. The holders of any shares of preferred stock could have preferences over the holders of our common stock with respect to dividends and liquidation rights. Any issuance of preferred stock may have the effect of delaying, deterring or preventing a change in control. Any issuance of preferred stock could decrease the amount of earnings and assets available for distribution to the holders of common stock and could adversely affect the rights and powers, including voting rights, of the holders of common stock. The issuance of preferred stock could have the effect of decreasing the market price of our common stock.

Item 1B. Unresolved Staff Comments.

Not Applicable.

Item 2. Properties.

Our principal executive offices are located in Billerica, Massachusetts. Information about our principal and certain other facilities is set forth below:

Location	Principal Function	Approximate Square Feet	Leased/ Owned	Reporting Segment
Bedford, Massachusetts	Research & Manufacturing	80,000	Owned	MC & SCEM
Billerica, Massachusetts ⁽¹⁾	Executive Offices, Research & Manufacturing	175,000	Leased	MC, SCEM & AMH
Burnet, Texas	Research & Manufacturing	86,000	Owned	SCEM
Decatur, Texas	Manufacturing	359,000	Owned	SCEM
Waller, Texas	Manufacturing	210,000	Owned	APS
Chaska, Minnesota	Executive Offices, Research & Manufacturing	186,000	Owned	AMH
Colorado Springs, Colorado	Manufacturing	82,000	Owned	AMH
Pueblo, Colorado	Manufacturing	250,000	Owned	APS
Danbury, Connecticut	Research & Manufacturing	73,000	Leased	SCEM
San Luis Obispo, California	Manufacturing	57,867	Owned	MC
San Luis Obispo, California	Manufacturing	59,124	Leased	MC
Hollister, California	Manufacturing	49,139	Owned	APS
Aurora, Illinois	Manufacturing	414,000	Owned	APS
Hillsboro, Oregon	Manufacturing	112,344	Leased	APS
Saint Fromond, France	Manufacturing	182,296	Owned	APS
San Giuliano Milanese, Italy	Manufacturing	138,840	Owned	APS
Riddings, UK	Manufacturing	82,779	Leased	APS
Hsin-chu, Taiwan	Executive Offices, Sales Research & Manufacturing	146,330	Leased	MC, SCEM & AMH
Kaohsiung City, Taiwan	Manufacturing	105,874	Owned	APS
JangAn, South Korea	Manufacturing	127,000	Owned	MC, SCEM & AMH
Oseong, South Korea	Manufacturing	108,355	Owned	APS
Suwon, South Korea	Executive Offices & Research	42,000	Leased	MC & SCEM
Kulim, Malaysia	Manufacturing	195,000	Owned	SCEM & AMH
Yonezawa, Japan	Manufacturing	185,000	Owned	MC & AMH
Tsu, Mie, Japan	Manufacturing	160,259	Owned	APS
Singapore	Manufacturing	215,235	Owned	APS

⁽¹⁾ This lease has been extended through September 30, 2026 and is subject to one five-year renewal option.

In addition, we own and lease space for manufacturing, distribution, technical support, sales, service, repair, and general administrative purposes in the United States, Canada, China, Germany, France, Israel, Japan, Malaysia, Singapore, South Korea and Taiwan. Leases for our facilities expire through October 2031. We currently expect to be able to extend the terms of expiring leases or to find suitable replacement facilities on reasonable terms. We believe that our facilities are well-maintained and suitable for their respective operations. We regularly assess the size, capability and location of our global infrastructure and periodically make adjustments based on these assessments.

Item 3. Legal Proceedings.

We are involved in certain legal actions. The outcomes of these legal actions are not within our complete control and may not be known for prolonged periods of time. In some actions, the claimants seek damages, as well as other relief, that could require significant expenditures or result in lost revenues. We record a liability for these legal actions when a loss is known or considered probable and the amount can be reasonably estimated. If the reasonable estimate of a known or probable loss is a range, and no amount within the range is a better estimate than any other, the minimum amount of the range is accrued. There is judgment required in the determination of the likelihood of outcome, and if necessary determination of the estimate or range of potential outcomes. Based on the current information, the Company does not believe any known matters have a reasonable possibility of a material amount for litigation or other contingencies related to legal proceedings.

Item 4. Mine Safety Disclosures.

Not applicable.

PART II

Item 5. Market for Registrant's Common Equity, Related Stockholder Matters and Issuer Purchases of Equity Securities.

Market Information and Holders

Entegris' common stock, \$0.01 par value per share, trades on the Nasdaq Global Select Market under the symbol "ENTG". As of February 13, 2023, there were 1,080 shareholders of record.

Dividend Policy

Holders of the Company's common stock are entitled to receive dividends when and if they are declared by the Company's board of directors. The Company's board of directors declared cash dividends of \$0.10 per share during each of the first, second, third and fourth quarters of 2022, which totaled \$57.3 million.

On January 18, 2023, the Company's board of directors declared a quarterly cash dividend of \$0.10 per share to be paid on February 22, 2023 to shareholders of record as of February 1, 2023.

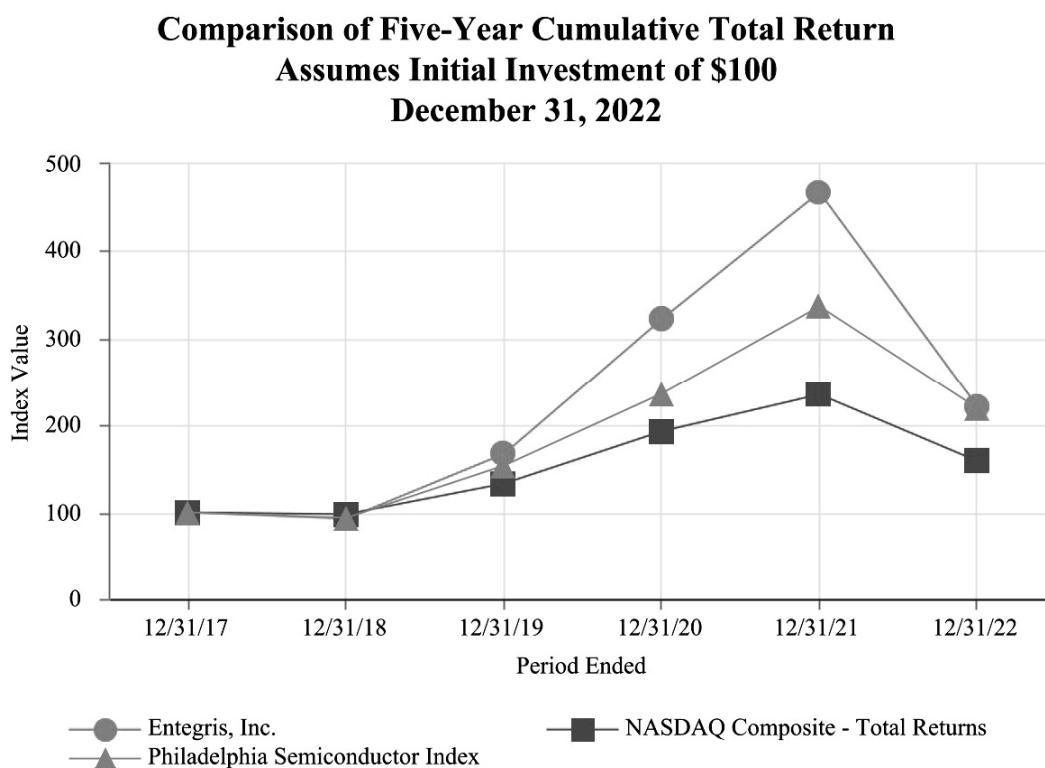
Future dividend declarations, if any, as well as the record and payment dates for such dividends, are subject to the final determination of our board of directors. Furthermore, the credit agreement governing the Credit Facilities contains restrictions that may limit our ability to pay dividends.

Issuer Sales of Unregistered Securities During the Past Three Years

None.

Comparative Stock Performance

The following graph compares the cumulative total shareholder return on the common stock of Entegris, Inc. from December 31, 2017 through December 31, 2022 with the cumulative total return of (1) The Nasdaq Composite Index, and (2) The Philadelphia Semiconductor Index, assuming \$100 was invested at the close of trading on December 31, 2017 in Entegris, Inc. common stock, the Nasdaq Composite Index and the Philadelphia Semiconductor Index and that all dividends are reinvested.



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	December 31, 2017	December 31, 2018	December 31, 2019	December 31, 2020	December 31, 2021	December 31, 2022
Entegris, Inc.	\$100.00	\$92.41	\$167.12	\$322.26	\$465.93	\$221.34
Nasdaq Composite	100.00	97.16	132.81	192.47	235.15	158.64
Philadelphia Semiconductor Index	100.00	93.95	153.38	235.69	336.68	219.25

Issuer Purchases of Equity Securities

The Company repurchased none of its common stock in 2022 under an authorized common stock repurchase plan.

The Company issues common stock awards under its equity incentive plans. In the consolidated financial statements, the Company treats shares of common stock withheld for tax purposes on behalf of its employees in connection with the vesting or exercise of the awards as common stock repurchases because they reduce the number of shares that would have been issued upon vesting or exercise. These withheld shares of common stock are not considered common stock repurchases under the Company's authorized common stock repurchase plan.

Item 6. Reserved

Item 7. Management’s Discussion and Analysis of Financial Condition and Results of Operations.

The following discussion and analysis of the Company’s consolidated financial condition and results of operations should be read along with the consolidated financial statements and the accompanying notes thereto included elsewhere in this Annual Report on Form 10-K. This discussion contains forward-looking statements that involve numerous risks and uncertainties, including, but not limited to, those described in Item 1A, “Risk Factors” and the “Cautionary Statements” section of this Item 7 below. You should review Item 1A “Risk Factors” of this Annual Report on Form 10-K for a discussion of important factors that could cause actual results to differ materially from the results described in or implied by the forward-looking statements contained in the following discussion and analysis. The Company has elected to omit discussion of the earliest of the three years covered by the consolidated financial statements presented except for the segment analysis. Information pertaining to fiscal year 2020 results of operations and the year-over-year comparison of changes in our Financial Condition and Results of Operations as of and for the year ended December 31, 2021 and 2020 can be found in Part II, Item 7, “Management’s Discussion and Analysis of Financial Condition and Results of Operations” of our Annual Report on Form 10-K for the year ended December 31, 2021, filed on February 4, 2022.

Cautionary Statements

This Annual Report on Form 10-K and the portions of the Company’s Definitive Proxy Statement incorporated by reference in this Annual Report on Form 10-K contain “forward-looking statements.” The words “believe,” “expect,” “anticipate,” “intend,” “estimate,” “forecast,” “project,” “should,” “may,” “will,” “would” or the negative thereof and similar expressions are intended to identify such forward-looking statements. These forward-looking statements may include statements about the ongoing impacts of the COVID-19 pandemic and the conflict in Ukraine on the Company’s operations and markets, including supply chain issues and inflationary pressures related thereto; future period guidance or projections; the Company’s performance relative to its markets, including the drivers of such performance; market and technology trends, including the duration and drivers of any growth trends; the development of new products and the success of their introductions; the focus of the Company’s engineering, research and development projects; the Company’s ability to execute on our business strategies, including with respect to Company’s expansion of its manufacturing presence in Taiwan and in Colorado Springs; the Company’s capital allocation strategy, which may be modified at any time for any reason, including share repurchases, dividends, debt repayments and potential acquisitions; the impact of the acquisitions the Company has made and commercial partnerships the Company has established, including the acquisition of CMC Materials; the closing of any announced divestitures, including the timing thereof; trends relating to the fluctuation of currency exchange rates; future capital and other expenditures, including estimates thereof; the Company’s expected tax rate; the impact, financial or otherwise, of any organizational changes; the impact of accounting pronouncements; quantitative and qualitative disclosures about market risk; and other matters. These forward-looking statements are based on current management expectations and assumptions only as of the date of this Quarterly Report, are not guarantees of future performance and involve substantial risks and uncertainties that are difficult to predict and that could cause actual results to differ materially from the results expressed in, or implied by, these forward-looking statements. These risks and uncertainties include, but are not limited to, weakening of global and/or regional economic conditions, generally or specifically in the semiconductor industry, which could decrease the demand for the Company’s products and solutions; the level of, and obligations associated with, the Company’s indebtedness, including the debts incurred in connection with the acquisition of CMC Materials; risks related to the acquisition and integration of CMC Materials, including unanticipated difficulties or expenditures relating thereto, the ability to achieve the anticipated synergies and value-creation contemplated by the acquisition of CMC Materials and the diversion of management time on transaction-related matters; risks related to the COVID-19 pandemic and the conflict in Ukraine on the global economy and financial markets, as well as on the Company, its customers and suppliers, which may impact its sales, gross margin, customer demand and its ability to supply its products to its customers; raw material shortages, supply and labor constraints and price increases; pricing and inflationary pressures and rising interest rates; operational, political and legal risks of the Company’s international operations; the Company’s dependence on sole source and limited source suppliers; the Company’s ability to meet rapid demand shifts; the Company’s ability to continue technological innovation and introduce new products to meet customers’ rapidly changing requirements; substantial competition; the Company’s concentrated customer base; the Company’s ability to identify, complete and integrate acquisitions, joint ventures, divestitures or other similar transactions; the Company’s ability to consummate pending transactions on a timely basis or at all and the satisfaction of the conditions precedent to consummation of such pending transactions, including the satisfaction of regulatory conditions on the terms expected, at all or in a timely manner; the Company’s ability to effectively implement any organizational changes; the Company’s ability to protect and enforce intellectual property rights; the increasing complexity of certain manufacturing processes; changes in government regulations of the countries in which the Company operates, including the imposition of tariffs, export controls and other trade laws and restrictions and changes to national security and international trade policy, especially as they relate to China; fluctuation of currency exchange rates; fluctuations in the market price of the Company’s stock; and other matters. These forward-looking statements are based on current management expectations and assumptions only as of the date of this Annual Report on Form 10-K, are not guarantees of future performance and involve substantial risks and uncertainties that are difficult to predict and that could cause actual results to differ materially from the results expressed in, or implied by, these forward-looking

statements. These risks and uncertainties include, but are not limited to, the risk factors and additional information described in this Annual Report on Form 10-K under the caption “Risk Factors,” elsewhere in this Annual Report on Form 10-K and in the Company’s other periodic filings. Except as required under the federal securities laws and the rules and regulations of the SEC, the Company undertakes no obligation to update publicly any forward-looking statements or information contained herein, which speak as of their respective dates.

Overview

This overview is not a complete discussion of the Company’s financial condition, changes in financial condition and results of operations; it is intended merely to facilitate an understanding of the most salient aspects of its financial condition and operating performance and to provide a context for the detailed discussion and analysis that follows, and must be read in its entirety in order to fully understand the Company’s financial condition and results of operations.

The Company is a leading supplier of advanced materials and process solutions for the semiconductor and other high-technology industries. We help our customers maximize manufacturing yields, reduce manufacturing costs and enable higher device performance by leveraging our unique breadth of capabilities to provide mission critical enhanced materials and process solutions for the most advanced manufacturing environments.

Our business is organized and operated in four operating segments, which align with the key elements of the advanced semiconductor manufacturing ecosystem.

- The Specialty Chemicals and Engineered Materials segment, or SCEM, provides high-performance and high-purity process chemistries, gases and materials, and safe and efficient materials delivery systems to support semiconductor and other advanced manufacturing processes.
- The Advanced Planarization Solutions segment, or APS, provides complementary chemical mechanical planarization solutions, advanced materials and high-purity wet chemicals; including CMP slurries, pads, formulated cleans and other electronic chemicals.
- The Microcontamination Control segment, or MC, offers solutions to filter and purify critical liquid and gaseous chemistries used in semiconductor manufacturing processes and other high-technology industries.
- The Advanced Materials Handling segment, or AMH, develops solutions to monitor, protect, transport and deliver critical liquid chemistries, wafers and other substrates for a broad set of applications in the semiconductor industry, life sciences and other high-technology industries.

These segments share common business systems and processes, technology centers and technology roadmaps. With the complementary capabilities across these segments, we believe we are uniquely positioned to create new, co-optimized and increasingly integrated solutions for our customers. For example, after the acquisition of CMC Materials, we now offer an end-to-end offering for our customers consisting of advanced deposition materials from our SCEM segment, CMP slurries, pads and post-CMP cleaning chemistries from our APS segment, CMP slurry filters from our MC segment, and CMP slurry high-purity packaging and fluid monitoring systems from our AMH segment.

Impact of New Export Control Regulations

On October 7, 2022, the U.S Department of Commerce, Bureau of Industry and Security (“BIS”) announced new export control regulations that restrict the sale of certain products and services to some companies and domestic fabs in China. Since these rules were published, we have assembled a global, cross-functional team to interpret the regulations, analyze how they may impact Entegris and determine how to best serve our customers going forward in compliance with these rules. These new rules restrict the sale of products and the provision of service to domestic fabs in China operating at or above certain advanced technology nodes. We currently estimate that the new regulations will reduce our net sales by approximately \$20 million per quarter in 2023. We intend to apply for export licenses where appropriate. See Item 1A, “Risk Factors,” for additional information regarding risk associated with the impact of new export control regulations, including under the caption “The impact of tariffs, export controls and other trade laws and restrictions, especially with respect to China”.

Impact of COVID-19 on our Business

The COVID-19 pandemic continues to impact the global economy. Infection rates vary across the countries in which we operate, and governmental authorities have continued to implement numerous and constantly evolving measures to try to contain the virus. Continuing impacts of the pandemic include a more challenging supply chain and global logistics environment. While we have experienced instances of raw material constraints, higher freight costs and delivery delays in both inbound shipments of raw materials and outgoing shipments of finished products to customers, we have not experienced material adverse impacts to our global operations. See Item 1A, “Risk Factors,” for additional information regarding risks associated with the COVID-19 pandemic, including under the caption “The impact of the COVID-19 pandemic.”

Impact of Conflict Between Russia and Ukraine

The military conflict between Russia and Ukraine and the sanctions imposed by the United States and other governments in response to this conflict have caused significant volatility and disruptions to global markets. We source certain materials from Russia and Ukraine, and we have been able to obtain an adequate supply of these materials to serve our customers, albeit at increased cost. We are proactively assessing and evaluating alternative sources to bolster our supply of these materials moving forward, in addition to working closely with our customers on any product re-qualification that may be required. Revenue relating to products manufactured from raw materials sourced from this region does not constitute a material portion of our business and historically, we have not received significant revenue from this region. The ultimate impact of the conflict on the global economy, supply chains, logistics, fuel prices, raw material pricing and our business remains uncertain. We cannot currently predict the ultimate impact of the conflict on our financial condition, results of operations or cash flows. See Item 1A, “Risk Factors,” for additional information regarding risk associated with the conflict between Russia and Ukraine, including under the caption “Risks Related to Our Business and Industry”.

Recent Events

On July 6, 2022 (“Closing Date”), we completed the acquisition of CMC Materials. We acquired all of the issued and outstanding common shares of CMC Materials for \$133.00 in cash and 0.4506 shares of our common stock per share, representing a total purchase price (inclusive of debt retired and cash assumed) at close of \$6.0 billion (based on our closing price on June 30, 2022), including \$3.8 billion in cash paid to CMC Materials’ shareholders, the issuance of 12.9 million shares of our common stock (excluding unvested CMC stock options and unvested CMC restricted stock units, restricted shares and performance share units equity awards assumed), \$0.9 billion of debt retired and approximately \$0.3 billion of acquired cash. We financed the cash portion of the purchase price through debt financing. See Note 10 to our consolidated financial statements for further discussion of the debt financing that occurred prior to and on the Closing Date.

During the three months ended October 1, 2022, the Company realigned its financial reporting structure to reflect management and organizational changes. The Company will report its financial performance based on four reportable segments: Specialty Chemicals and Engineered Materials, Microcontamination Control, Advanced Material Handling and Advanced Planarization Solutions. See Note 20 to the consolidated financial statements for additional information on the Company’s four segments.

On July 28, 2022, we entered into an interest rate swap agreement. The interest rate swap is a floating-to-fixed interest rate swap contract to hedge the variability in Secured Overnight Financing Rate (“SOFR”)-based interest payments associated with \$1.95 billion of our \$2.495 billion Initial Term Loan Facility. The notional amount is scheduled to decrease quarterly and will expire on December 30, 2025. See Note 12 to our consolidated financial statements for further discussion of our derivative instruments.

On August 16, 2022, the U.S. government enacted the Inflation Reduction Act of 2022 (“IRA”) that includes, among other provisions, changes to the U.S. corporate income tax system, including a 15% minimum tax based on “adjusted financial statement income” exceeding \$1 billion and a 1% excise tax on net repurchases of stock after December 31, 2022, as well as tax credits for clean energy initiatives. We are evaluating the IRA and its requirements, as well as any potential impact on our business.

On October 11, 2022, the Company entered into a definitive agreement with Infineum USA L.P. to sell our PIM business, which became part of the Company with the recent acquisition of CMC Materials. Effective February 10, 2023, the Company terminated the definitive agreement in accordance with its terms. At the time of the termination, the transaction had not received clearance under the HSR Act.

On January 20, 2023, the Company announced a definitive agreement for Quad-C Management to acquire the QED business, which became part of the Company with the recent acquisition of CMC Materials. The selling price is expected to be approximately \$135.0 million, subject to customary purchase price adjustments.

Critical Accounting Policies and Estimates

Management’s discussion and analysis of financial condition and results of operations are based upon the Company’s consolidated financial statements, which have been prepared in accordance with accounting principles generally accepted in the United States, or GAAP. The preparation of these consolidated financial statements requires the Company to make estimates, assumptions and judgments that affect the reported amounts of assets, liabilities, revenues and expenses and related disclosure of contingent assets and liabilities. At each balance sheet date, management evaluates its estimates, including, but not limited to, those related to long-lived assets (property, plant and equipment, and identified intangible assets), goodwill and income taxes. The Company bases its estimates on historical experience and various other assumptions that management believes to be reasonable under the circumstances. Management’s utilization of different judgments or estimates could result in material differences in the amount and timing of the Company’s results of operations for any period. In addition, actual results could be different from the Company’s current estimates, possibly resulting in increased future charges to earnings.

Our critical accounting policies that are most significantly affected by estimates, assumptions and judgments used in the preparation of the Company's consolidated financial statements relate to business acquisitions and are discussed below. See Note 1 to the Company's consolidated financial statements for additional information about the Company's other significant accounting policies.

Business Acquisitions

The Company accounts for acquired businesses using the acquisition method of accounting, which requires that the assets acquired and liabilities assumed be recorded at the date of acquisition at their respective fair values. The judgments made in determining the estimated fair value assigned to each class of assets acquired and liabilities assumed, as well as asset lives, can materially impact net income. Accordingly, for significant items the Company typically obtains assistance from a third-party valuation firm.

There are several methods that can be used to determine the fair value of assets acquired and liabilities assumed in a business combination. For intangible assets, the Company normally utilizes the "income method," which starts with a forecast of all of the expected future net cash flows attributable to the subject intangible asset. These cash flows are then adjusted to present value by applying an appropriate discount rate that reflects the risk factors associated with the cash flow streams. Depending on the asset valued, the key assumptions included one or more of the following: (1) future revenue growth rates, (2) future gross margin, (3) future selling, general and administrative expenses, (4) royalty rates, and (5) discount rates.

Estimating the useful life of an intangible asset also requires judgment. For example, different types of intangible assets will have different useful lives, influenced by the nature of the asset, competitive environment, and rate of change in the industry. Certain assets may even be considered to have indefinite useful lives. All of these judgments and estimates can significantly impact the determination of the amortization period of the intangible asset, and thus net income.

Results of Operations

Year ended December 31, 2022 compared to year ended December 31, 2021

The following table sets forth the results of operations and the relationship between various components of operations, stated as a percent of net sales, for 2022 and 2021.

	2022		2021	
<i>(Dollars in thousands)</i>		% of net sales		% of net sales
Net sales	\$ 3,282,033	100.0 %	\$ 2,298,893	100.0 %
Cost of sales	1,885,620	57.5	1,239,229	53.9
Gross profit	1,396,413	42.5	1,059,664	46.1
Selling, general and administrative expenses	543,485	16.6	292,408	12.7
Engineering, research and development expenses	228,994	7.0	167,632	7.3
Amortization of intangible assets	143,953	4.4	47,856	2.1
Operating income	479,981	14.6	551,768	24.0
Interest expense	212,669	6.5	41,240	1.8
Interest income	(3,694)	(0.1)	(243)	—
Other expense, net	23,926	0.7	31,695	1.4
Income before income taxes	247,080	7.5	479,076	20.8
Income tax expense	38,160	1.2	69,950	3.0
Net income	\$ 208,920	6.4	\$ 409,126	17.8

Net sales For 2022, net sales were \$3,282.0 million, up \$983.1 million, or 43%, from 2021. An analysis of the factors underlying the increase in net sales is presented in the following table:

<i>(In thousands)</i>	
Net sales in 2021	\$ 2,298,893
Increase mainly associated with volume exclusive of acquired businesses	594,407
Increase associated with acquired businesses	495,591
Decrease associated with effect of foreign currency translation	(106,858)
Net sales in 2022	\$ 3,282,033

Total net sales increased primarily driven by the inclusion of sales from the acquisition of CMC Materials for the six-month period subsequent to the Closing Date. Growth was also driven in our unit driven solutions, including liquid filtration, selective etch, gas purification systems and advanced deposition materials, which are of growing importance to our customers' technology. Total net sales also reflected unfavorable foreign currency translation effects of \$106.9 million, mainly due to the significant weakening of the Japanese yen and the Korean won relative to the U.S. dollar.

Sales percentage on a geographic basis for 2022 and 2021 and the percentage increase in sales for 2022 compared to sales for 2021 were as follows:

	Year ended		Percentage increase in sales
	December 31, 2022	December 31, 2021	
North America	24 %	23 %	51 %
Taiwan	20 %	20 %	45 %
China	15 %	16 %	38 %
South Korea	13 %	14 %	31 %
Japan	11 %	13 %	16 %
Europe	10 %	9 %	55 %
Southeast Asia	7 %	5 %	88 %

The increase in sales for all geographic areas was primarily driven by the inclusion of sales from the CMC Materials acquisition and a general increase in demand for products.

Gross margin

The following table sets forth gross margin as a percentage of net revenues:

	2022	2021	Percentage point change
Gross margin as a percentage of net revenues:	42.5 %	46.1 %	-3.6

Gross margin decreased by 3.6 percentage points for 2022 compared to 2021, primarily due to a \$61.9 million charge or 1.9 percentage point change for fair value write-up of acquired CMC Materials inventory sold during the three-month period subsequent to the CMC Materials acquisition, and the inclusion of CMC Materials' products, which have aggregate lower gross margins.

Selling, general and administrative expenses

Selling, general and administrative expenses consist primarily of payroll and related expenses for the sales and administrative staff, professional fees (including accounting, legal and technology costs and expenses), and sales and marketing costs. SG&A expenses for 2022 increased \$251.1 million, or 86%, to \$543.5 million from \$292.4 million in 2021.

An analysis of the factors underlying the increase in SG&A expenses is presented in the following table:

(In thousands)

Selling, general and administrative expenses in 2021	\$	292,408
SG&A expense recorded by CMC Materials and included in Company's financial statements after the date of the acquisition		68,249
Employee costs, exclusive of CMC Materials		12,533
Deal and transaction costs		34,799
Integration costs		46,951
Contractual and non-cash integration costs		61,964
Professional costs, exclusive of CMC Materials		7,734
Travel costs, exclusive of CMC Materials		4,029
Other increases, net		14,818
Selling, general and administrative expenses in 2022	\$	543,485

Engineering, research and development expenses

Engineering, research and development expenses consist of expenses for the support of current product lines and the development of new products and manufacturing technologies. These expenses were \$229.0 million in 2022 and \$167.6 million in 2021.

An analysis of the factors underlying the increase in ER&D expenses is presented in the following table:

(In thousands)

Engineering, research and development expense in 2021	\$	167,632
ER&D expense recorded by CMC Materials and included in Company's financial statements after the date of the acquisition		25,993
Employee costs, exclusive of CMC Materials		18,419
Project related costs, exclusive of CMC Materials		10,734
Other increases, net		6,216
Engineering, research and development expense in 2022	\$	228,994

The Company's overall ER&D efforts will continue to focus on developing and improving its technology platforms for semiconductor and advanced processing applications and identifying and developing products for new applications, and the Company often works directly with its customers to address their particular needs. As a percentage of revenue, the Company expects to increase ER&D expenses in the coming years.

Amortization of intangible assets Amortization of intangible assets was \$144.0 million in 2022 compared to \$47.9 million for 2021. The increase primarily reflects additional amortization expense associated with the recent acquisition of CMC Materials.

Interest expense Interest expense was \$212.7 million in 2022 and \$41.2 million in 2021. Interest expense includes interest associated with debt outstanding and the amortization of debt issuance costs associated with such borrowings. The increase primarily reflects higher interest expense related to the debt financing of the CMC Materials acquisition.

Interest income Interest income was \$3.7 million in 2022 and \$0.2 million in 2021. The increase reflects rising average interest rates and cash balances.

Other expense, net Other expense, net, was \$23.9 million in 2022 compared to \$31.7 million in 2021.

In 2022, other expense, net consisted mainly of consisted mainly of foreign currency transaction losses of \$23.0 million.

In 2021, other expense, net consisted mainly of a loss on extinguishment of debt of \$23.1 million associated with the redemption of the Company's \$550 million aggregate principal amount of senior unsecured notes due 2026 and foreign currency transaction losses of \$7.9 million.

Income tax expense The Company recorded income tax expense of \$38.2 million in 2022 compared to income tax expense of \$70.0 million in 2021. The Company's effective tax rate was 15.4% in 2022 compared to an effective tax rate of 14.6% in 2021.

The increase in the effective tax rate from 2021 to 2022 primarily relates to a reduction in creditable foreign withholding taxes during the year. This was partially offset by certain acquisition related expenses that were recorded during the year and a change in income geographic mix. Additionally, the tax rate for 2021 included the reversal of a valuation allowance on foreign tax credits generated during 2020 of \$6.2 million and the recognition of a capital loss tax benefit of \$5.1 million. These tax benefits were offset in part by tax recorded on the sale of intangible property of \$3.5 million in 2021. The income tax expense for 2022 and 2021 includes discrete benefits of \$4.0 million and \$13.8 million, respectively, recorded in connection with share-based compensation.

Net income Net income was \$208.9 million, or \$1.46 per diluted share, in 2022 compared to net income of \$409.1 million, or \$3.00 per diluted share, in 2021. The decrease reflects the Company's aforementioned operating results described in greater detail above and an increase of 12.9 million shares of common stock issued in connection with the CMC Materials acquisition that increased the number of dilutive shares outstanding.

Non-GAAP Financial Measures Information The Company's consolidated financial statements are prepared in conformity with accounting principles generally accepted in the United States. The Company also utilizes certain non-GAAP financial measures as a complement to financial measures provided in accordance with GAAP in order to better assess and reflect trends affecting the Company's business and results of operations. See "Non-GAAP Information" included below in this section for additional detail, including the reconciliation of the Company's non-GAAP measures to the most directly comparable GAAP measures.

The Company's non-GAAP financial measures include adjusted EBITDA and adjusted operating income, together with related percentage changes, and non-GAAP earnings per share, or EPS.

Adjusted EBITDA increased to \$973.2 million in 2022, compared to \$699.4 million in 2021. Adjusted EBITDA as a percent of net sales was 29.7% in 2022 compared to 30.4% in 2021. Adjusted operating income increased 37.6% to \$837.9 million in

2022, compared to \$609.1 million in 2021. Adjusted operating income as a percent of net sales was 25.5% in 2022 compared to 26.5% in 2021. Non-GAAP EPS increased 8.4% to \$3.73 in 2022, compared to \$3.44 in 2021. The decreases in adjusted EBITDA and adjusted operating income as a percentage net sales reflects lower gross margin.

Segment Analysis

Effective July 6, 2022, coincident to and in conjunction with the CMC acquisition (see Note 3 to the consolidated financial statements) the Company changed its financial segment reporting to reflect management and organizational changes made by the Company. The Company reports its financial performance based on four reportable segments: Specialty Chemicals and Engineered Materials, Microcontamination Control, Advanced Material Handling and Advanced Planarization Solutions. The change which included a transfer of some related operations in our Specialty Chemicals and Engineered Materials reportable segment to our Advanced Planarization Solutions reportable segment. Accordingly, our segment information was restated retroactively in the third quarter of fiscal 2022. The segment realignment had no impact on the Microcontamination Control or Advanced Materials Handling segments. See Note 20 to the consolidated financial statements for additional information on the Company's four segments. The following is a discussion of the results of operations of these four business segments.

The following table and discussion concern the results of operations of the Company's four reportable segments for the years ended December 31, 2022, 2021 and 2020.

<i>(In thousands)</i>	2022	2021	2020
Specialty Chemicals and Engineered Materials			
Net sales	\$ 773,594	\$ 625,670	\$ 530,040
Segment profit	122,287	137,392	99,474
Microcontamination Control			
Net sales	\$ 1,105,996	\$ 919,363	\$ 742,186
Segment profit	411,475	321,300	248,910
Advanced Materials Handling			
Net sales	\$ 846,492	\$ 704,946	\$ 538,682
Segment profit	183,738	159,995	111,028
Advanced Planarization Solutions			
Net sales	\$ 606,614	\$ 85,621	\$ 79,492
Segment profit	96,902	30,415	28,495
Unallocated general and administrative expenses	\$ 190,468	\$ 49,478	\$ 39,370

Specialty Chemicals and Engineered Materials (SCEM)

For 2022, SCEM net sales increased to \$773.6 million, up 24% from \$625.7 million in 2021. The sales increase primarily reflects the inclusion of sales of \$90.1 million from inclusion of certain product lines from the acquisition of CMC Materials, while the remainder reflects modestly improved sales of advanced deposition materials, formulated cleans, selective etch and specialty coatings products.

SCEM reported a segment profit of \$122.3 million for 2022, down 11% compared to \$137.4 million in 2021. The decrease in SCEM's profit in 2022 was primarily due unfavorable product mix, the absence of a gain on a sale of non-core intangibles and higher operating expenses of 31% mainly due to the expenses incurred by the inclusion of certain product lines of CMC Materials and a \$5.1 million charge for a fair value write-up of acquired CMC Materials inventory sold, partially offset by higher sales.

For 2021, SCEM net sales increased to \$625.7 million, up 18% from \$530.0 million in 2020. The sales increase was mainly due to increased sales of specialty gases and advanced deposition materials, formulated cleaning chemistries and advanced coatings products.

SCEM reported a segment profit of \$137.4 million for 2021, up 38% compared to \$99.5 million in 2020. The increase in SCEM's profit in 2022 was primarily due to higher sales and a gain on a sale of non-core intangibles.

Microcontamination Control (MC)

For 2022, MC net sales increased to \$1,106.0 million, up 20% from \$919.4 million in 2021. The sales increase was due to improved performance across substantially all platforms, with growth especially strong in liquid filtration and gas filtration products.

MC reported a segment profit of \$411.5 million for 2022, up 28% compared to \$321.3 million in 2021. The increase in MC's profit in 2022 was primarily due to higher gross profit related to the increased sales volume, partially offset by higher operating expenses of 17%, primarily due to higher compensation costs.

For 2021, MC net sales increased to \$919.4 million, up 24% from \$742.2 million in 2020. The sales increase was due to improved performance across substantially all platforms, with growth especially strong in liquid filtration and gas filtration products.

MC reported a segment profit of \$321.3 million for 2021, up 29% compared to \$248.9 million in 2020. The increase in MC's profit in 2021 was primarily due to higher gross profit related to the increased sales volume, partially offset by higher operating expenses of 13%, primarily due to higher compensation costs.

Advanced Materials Handling (AMH)

For 2022, AMH net sales increased 20% to \$846.5 million from \$704.9 million in 2021. The sales increase was mainly due to improved sales from wafer handling and fluid handling.

AMH reported a segment profit of \$183.7 million for 2022, up 15% compared to \$160.0 million in 2021. The increase in AMH's profit in 2022 was primarily due to higher sales volume, partially offset by a 16% increase in operating expenses, primarily due to higher compensation costs.

For 2021, AMH net sales increased 31% to \$704.9 million from \$538.7 million in 2020. The sales increase was mainly due to improved sales from wafer handling, fluid handling and measurement products and sales of our Aramus high purity bags, as well as additional sales of \$6.8 million attributable to the acquisition of Global Measurement Technologies, Inc. and its manufacturing partner Clean Room Plastics, Inc., which are referred to collectively herein as GMTI.

AMH reported a segment profit of \$160.0 million for 2021, up 44% compared to \$111.0 million in 2020. The increase in AMH's profit in 2021 was primarily due to higher sales volume, favorable product mix, partially offset by a 16% increase in operating expenses, primarily due to higher compensation costs.

Advanced Planarization Solutions (APS)

For 2022, APS net sales increased 608% to \$606.6 million from \$85.6 million in 2021. The sales increase was mainly due to sales attributed to the CMC Materials acquisition.

APS reported a segment profit of \$96.9 million for 2022, up 219% compared to \$30.4 million in 2021. The segment profit increase was primarily due to the segment profit attributed to the CMC Materials acquisition, partially offset by a \$56.8 million charge for a fair value write-up of acquired CMC Materials inventory sold.

For 2021, APS net sales increased 8% to \$85.6 million from \$79.5 million in 2020. The sales increase was mainly due to improved sales from CMP cleans products, as well as additional sales of \$1.2 million attributable to the acquisition of BASF's Precision Microchemicals business in the fourth quarter of 2021.

APS reported a segment profit of \$30.4 million for 2021, up 7% compared to \$28.5 million in 2020. The increase in APS's profit in 2022 was primarily due to higher sales volume.

Unallocated general and administrative expenses

Unallocated general and administrative expenses for 2022 totaled \$190.5 million compared to \$49.5 million for 2021. The \$141.0 million increase mainly reflects the increase of \$106.2 million and \$34.8 million in integration related and deal and transaction costs, respectively, related to the acquisition of CMC Materials.

Liquidity and Capital Resources

We consider the following when assessing our liquidity and capital resources:

<i>In thousands</i>	December 31, 2022	December 31, 2021
Cash, cash equivalents and restricted cash	\$ 563,439	\$ 402,565
Working capital	1,573,254	934,369
Total debt	5,784,893	937,027

The Company has historically financed its operations and capital requirements through cash flow from its operating activities, long-term loans, lease financing and borrowings under domestic and international short-term lines of credit. On April 14, 2022, the Company, via a wholly-owned escrow subsidiary, completed a private offering of \$1.6 billion aggregate principal amount of the 2029 Notes. On June 30, 2022, the Company, via a wholly-owned escrow subsidiary, completed a private offering of \$0.9 billion aggregate principal amount of the 2030 Notes. In connection with the acquisition of CMC Materials on the Closing Date, the Company borrowed \$2.495 billion under the Initial Term Loan Facility and increased commitments by \$175.0 million

under the Revolving Facility (from \$400.0 million to \$575.0 million). The Company used a portion of the proceeds of the offering to repay the remaining principal amount of the \$145.0 million senior secured term loan facility due 2025. In addition, on the Closing Date, the Company entered into a 364-Day Bridge Credit Agreement and borrowed \$275 million aggregate principal amount with a pricing of SOFR plus 4.55%. During the year, the Company made \$140.0 million principal payments on the Bridge Credit Facility.

Based on our analysis, we believe our existing balances of domestic cash and cash equivalents and our currently anticipated operating cash flows will be sufficient to meet our cash needs arising in the ordinary course of business for the next twelve months and for the longer term.

We may seek to take advantage of opportunities to raise additional capital through additional debt financing or through public or private sales of securities. If in the future our available liquidity is not sufficient to meet the Company's operating and debt service obligations as they come due, management would need to pursue alternative arrangements through additional equity or debt financing in order to meet the Company's cash requirements. There can be no assurance that any such financing would be available on commercially acceptable terms, or at all. In 2022, we did not experience difficulty accessing capital and credit markets, but future volatility in the capital and credit markets may increase costs associated with issuing debt instruments or affect our ability to access those markets. In addition, it is possible that our ability to access the capital and credit markets could be limited at a time when we would like, or need, to do so, which could have an adverse impact on our ability to refinance maturing debt and/or react to changing economic and business conditions.

In summary, our cash flows for each period were as follows:

<i>(in thousands)</i>	Year ended December 31, 2022	Year ended December 31, 2021
Net cash provided by operating activities	\$ 352,283	\$ 400,454
Net cash used in investing activities	(4,945,709)	(298,118)
Net cash provided by (used in) financing activities	4,766,203	(276,497)
Increase (decrease) in cash and cash equivalents	160,874	(178,328)

Operating activities

Cash provided by operating activities is net income adjusted for certain non-cash items and changes in assets and liabilities.

Compared to 2021, the \$48.2 million decrease in cash provided by operating activities in 2022 was primarily driven by a \$41.6 million of changes in operating assets and liabilities and a \$6.5 million decrease of net income adjusted for non-cash reconciling items.

Changes in working capital for 2022 were driven by higher inventory and lower accounts payable and accrued liabilities, partially offset by lower income taxes payables and lower trade accounts receivable. The change for inventory is due to an increase in raw material purchases to mitigate potential supply chain issues related to COVID-19 and increased business activity. The change for accounts payable and accrued liabilities was driven by timing of payments. The change for taxes was primarily driven by higher tax provision compared to the prior year. The change for trade accounts receivables and notes receivables was primarily due a lower increase in sales compared to that of the comparable previous period.

Investing activities

Investing cash flows consist primarily of capital expenditures, cash used for acquisitions and proceeds from sales of property and equipment.

The increase in cash used in investing activities in 2022 compared to 2021 was primarily due to higher cash paid for acquisitions of property, plant and equipment and for acquisitions.

Acquisition of property and equipment totaled \$466.2 million in 2022, which primarily reflected investments in facilities, equipment and tooling, compared to \$210.6 million in 2021, which also primarily reflected investments in equipment and tooling. Capital expenditures in 2022 generally reflected more spending related to growth capacity investments and the investment in our previously announced investment in our new facility in Taiwan.

In 2022, the Company acquired CMC Materials. The cash used to acquire these assets was \$4,474.9 million, net of cash acquired. The transaction is described in further detail in Note 3 to the Company's consolidated financial statements.

In 2021, the Company acquired BASF's Precision Microchemicals business and certain assets of another company in an immaterial transaction. The cash used to acquire these assets was \$91.9 million, net of cash acquired. The transactions are described in further detail in Note 3 to the Company's consolidated financial statements.

Financing activities

Financing cash flows consist primarily of repurchases of common stock, payment of dividends to stockholders, issuance and repayment of short-term and long-term debt, and proceeds from the sale of shares of common stock through employee equity incentive plans.

In 2022, there was \$4,766.2 million of cash provided by financing activities compared to \$276.5 million cash used in financing activities in 2021. The change was primarily due to the net debt activity, which was a source of cash of \$4.8 billion in 2022 compared to a use of cash of \$174.1 million, and the absence of \$67.1 million of repurchase and retirement of common stock. See Note 10 to the Company's consolidated financial statements for further discussion of the debt financing that occurred during the year. In anticipation of its acquisition of CMC Materials, the Company suspended its previously announced share repurchase program in the fourth quarter of 2021 and did not authorize a new repurchase program or resume a repurchase program in 2022.

The Company's total dividend payments were \$57.3 million in 2022 compared to \$43.5 million in 2021. The Company has paid a cash dividend in each quarter since the fourth quarter of 2017. On January 18, 2023, the Company's board of directors declared a quarterly cash dividend of \$0.10 per share to be paid on February 22, 2023 to shareholders of record as of February 1, 2023.

Other Liquidity and Capital Resources Considerations

Debt at par value outstanding

<i>(In thousands)</i>	December 31, 2022	December 31, 2021
Senior secured term loan facility due 2029	\$ 2,495,000	\$ —
Senior secured notes due 2029 at 4.75%	1,600,000	—
Senior unsecured notes due 2030 at 5.95%	895,000	—
Senior unsecured notes due 2029 at 3.625%	400,000	400,000
Senior unsecured notes due 2028 at 4.375%	400,000	400,000
Bridge credit facility due 2023	135,000	—
Senior secured term loan facility due 2025 at 2.457%	—	145,000
Revolving facility due 2026	—	—
Total debt (par value)	<u>\$ 5,925,000</u>	<u>\$ 945,000</u>

In connection with the acquisition of CMC Materials, the Company obtained the following financing: On the Closing Date, the Company entered into a Term Loan B Facility of \$2.495 billion with a pricing at SOFR plus 3.00%. The Company previously syndicated the Initial Term Loan Facility on March 2, 2022 and incurred ticking fees through the Closing Date. The Company used a portion of the proceeds of the offering to repay the remaining principal amount of the \$145.0 million senior secured term loan facility due 2025. During the year, the Company incurred \$12.0 million in ticking fees, which were recorded to interest expense in the consolidated statement of operations. On the Closing Date, the Company entered into a \$275 million senior unsecured Bridge Credit Facility with a pricing of SOFR plus 4.55%. The Company made \$140.0 million of principal payments on the Bridge Credit Facility during 2022. On June 30, 2022, the Company issued, via a wholly-owned escrow subsidiary, \$895 million aggregate principal amount of the 2030 Notes. On April 14, 2022, the Company also issued, via a wholly-owned escrow subsidiary, \$1.6 billion aggregate principal amount of the 2029 Notes.

The Company increased the commitments under the Revolving Facility by \$175.0 million (from \$400.0 million to \$575.0 million) in connection with the closing of the acquisition of CMC Materials on the Closing Date. The Revolving Facility bears interest at a rate per annum equal to, at the Company's option, either a base rate (such as prime rate) or SOFR, plus, in each case, an applicable margin. During the year, the Company borrowed and repaid \$201.0 million under the Revolving Facility. At December 31, 2022, there was no balance outstanding under the Revolving Facility and we had undrawn outstanding letters of credit of \$1.5 million.

On July 28, 2022, the Company entered into a floating-to-fixed interest rate swap agreement to hedge the variability in SOFR based interest payments associated with \$1.95 billion of its \$2.495 billion Initial Term Loan Facility. The notional amount is scheduled to decrease quarterly and will expire on December 30, 2025.

Through December 31, 2022, the Company was in compliance with all applicable financial covenants included in the terms of its debt arrangements.

The Company also has a line of credit with one bank that provides for borrowings of Japanese yen for the Company's Japanese subsidiary equivalent to an aggregate of approximately \$7.6 million. There were no outstanding borrowings under this line of credit at December 31, 2022.

Cash and cash requirements

<i>(In thousands)</i>	December 31, 2022	December 31, 2021
Cash and cash equivalents	\$ 561,559	\$ 402,565
U.S.	136,262	107,814
Non-U.S.	425,297	294,751
Restricted cash - U.S.	1,880	—
Cash, cash equivalents and restricted cash	<u>\$ 563,439</u>	<u>\$ 402,565</u>

Our cash and cash equivalents include cash on hand and highly liquid debt securities with original maturities of three months or less, which are valued at cost and approximate fair value. We utilize a variety of funding strategies in an effort to ensure that our worldwide cash is available in the locations in which it is needed.

Our restricted cash represents cash held in a "Rabbi" trust and is not available for general corporate purposes. See Note 5 to the consolidated financial statements for additional information.

Cash requirements

We have cash requirements to support working capital needs, capital expenditures, business acquisitions, contractual obligations, commitments, principal and interest payments on debt and other liquidity requirements associated with our operations. We generally intend to use available cash and funds generated from our operations to meet these cash requirements, but in the event that additional liquidity is required we may also borrow under our Revolving Facility.

The following table summarizes our short and long-term cash requirements as of December 31, 2022:

<i>(In thousands)</i>	Total	Due within one year of December 31, 2022	Due later than one year from December 31, 2022
Long-term debt	\$ 5,925,000	\$ 153,713	\$ 5,771,287
Interest payments on long-term debt	2,080,742	323,177	1,757,565
Capital purchase obligations	252,333	191,571	60,762
Supply purchase obligations	12,775	8,765	4,010
Operating leases	117,296	22,817	94,479
Income tax liabilities	489,249	98,057	391,192
Total	<u>\$ 8,877,395</u>	<u>\$ 798,100</u>	<u>\$ 8,079,295</u>

Long-term debt and interest payments on long-term debt. We have contractual obligations for principal and interest payments on our long-term debt. See Note 10 of the consolidated financials for additional information. Debt obligations are classified based on their stated maturity date, regardless of their classification on the Company's consolidated balance sheets. Interest projections on both variable and fixed rate long-term debt are based on interest rates effective as of December 31, 2022 and do not include \$140.1 million for net unamortized discounts and debt issuance costs. On July 28, 2022, the Company entered into a floating-to-fixed interest rate swap agreement to hedge the variability in SOFR-based interest payments associated with \$1.95 billion of its \$2.495 billion Initial Term Loan Facility. The notional amount is scheduled to decrease quarterly and will expire on December 30, 2025. The impact of the interest rate swap is not considered in the interest payments above.

Capital purchase obligations. We have capital purchase obligations that represent commitments for the construction or purchase of property, plant and equipment. They were not recorded as liabilities on the Company's consolidated balance sheet as of December 31, 2022, as the Company had not yet received the related goods or taken title to the property.

We expect capital expenditure spending to be approximately \$500.0 million in 2023 for growth capacity investments and the construction of our new manufacturing facilities in Taiwan and Colorado.

Supply purchase obligations. We have non-cancelable commitments, including take-or-pay contracts, that are not presented as capital purchase commitments above. They were not recorded as liabilities on the Company's consolidated balance sheet as of December 31, 2022, as the Company had not yet received the related goods or taken title to the property.

Operating lease commitments. Commitments under operating leases primarily relate to leasehold properties. See Note 14 of the consolidated financials for additional information.

Income tax liabilities. Of the tax liabilities included in the table above, \$53.5 million relates to uncertain tax positions. We are unable to accurately predict when these amounts will be realized or released. However, it is reasonably possible that there could be significant changes to our unrecognized tax benefits in the next twelve months due to a tax audit settlement or some other unforeseeable event. See Note 16 of the consolidated financials for additional information.

New Accounting Pronouncements

Recently adopted accounting pronouncements Refer to Note 1 to the Company's consolidated financial statements for a discussion of accounting pronouncements implemented in 2022. Other than the adoption of ASU 2021-08, Business Combinations (Topic 805) and ASU 2021-10, Government Assistance (Topic 832), there were no recently issued accounting pronouncements adopted in 2022.

Recently issued accounting pronouncements Refer to Note 1 of the Company's consolidated financial statements for a discussion of accounting pronouncements recently issued but not yet adopted.

Non-GAAP Information The Company's consolidated financial statements are prepared in conformity with GAAP.

The Company also utilizes certain non-GAAP financial measures as a complement to financial measures provided in accordance with GAAP in order to better assess and reflect trends affecting the Company's business and results of operations. These non-GAAP financial measures include adjusted EBITDA and adjusted operating income, together with related measures thereof, and non-GAAP earnings per share, as well as certain other supplemental non-GAAP financial measures included in the discussion of the Company's financial results.

Adjusted EBITDA is defined by the Company as net income before (1) income tax expense, (2) interest expense, (3) interest income, (4) other expense (income), net, (5) charge for fair value write-up of acquired inventory sold, (6) deal and transaction costs, (7) integration costs, (8) contractual and non-cash integration costs (9) severance and restructuring costs, (10) gain on sale of subsidiary, (11) amortization of intangible assets and (12) depreciation. Adjusted operating income is defined by the Company as adjusted EBITDA exclusive of the depreciation addback noted above. The Company also utilizes non-GAAP financial measures whereby adjusted EBITDA and adjusted operating income are each divided by the Company's net sales to derive adjusted EBITDA margin and adjusted operating margin, respectively.

Non-GAAP Net Income is defined by the Company as net income before, as applicable, (1) charge for fair value write-up of acquired inventory sold, (2) deal and transaction costs, (3) integration costs, (4) contractual and non-cash integration costs (5) severance and restructuring costs, (6) loss on extinguishment of debt and modification, (7) interest expense, net (8) gain on sale of business, (9) amortization of intangible assets and (10) the tax effect of the foregoing adjustments to net income, stated on a per share basis, divided by diluted weighted average shares outstanding. Non-GAAP EPS is defined as our Non-GAAP Net Income divided by our diluted weighted-average shares outstanding.

The Company provides supplemental non-GAAP financial measures to help management and investors to better understand its business and believes these measures provide investors and analysts additional and meaningful information for the assessment of the Company's ongoing results. Management also uses these non-GAAP measures to assist in the evaluation of the performance of its business segments and to make operating decisions.

Management believes the Company's non-GAAP measures help indicate the Company's baseline performance before certain gains, losses or other charges that may not be indicative of the Company's business or future outlook and offer a useful view of business performance in that the measures provide a more consistent means of comparing performance. The Company believes the non-GAAP measures aid investors' overall understanding of the Company's results by providing a higher degree of transparency for such items and providing a level of disclosure that will help investors understand how management plans, measures and evaluates the Company's business performance. Management believes that the inclusion of non-GAAP measures provides greater consistency in its financial reporting and facilitates investors' understanding of the Company's historical operating trends by providing an additional basis for comparisons to prior periods.

Management uses adjusted EBITDA and adjusted operating income to assist it in evaluations of the Company's operating performance by excluding items that management does not consider as relevant in the results of its ongoing operations. Internally, these non-GAAP measures are used by management for planning and forecasting purposes, including the preparation of internal budgets; for allocating resources to enhance financial performance; for evaluating the effectiveness of operational strategies; and for evaluating the Company's capacity to fund capital expenditures, secure financing and expand its business.

In addition, and as a consequence of the importance of these non-GAAP financial measures in managing its business, the Company's board of directors uses non-GAAP financial measures in the evaluation process to determine management compensation.

The Company believes that certain analysts and investors use adjusted EBITDA, adjusted operating income and non-GAAP EPS as supplemental measures to evaluate the overall operating performance of firms in the Company's industry. Additionally, lenders or potential lenders use adjusted EBITDA measures to evaluate the Company's creditworthiness.

The presentation of non-GAAP financial measures is not meant to be considered in isolation, as a substitute for, or superior to, financial measures or information provided in accordance with GAAP. Management strongly encourages investors to review the Company's consolidated financial statements in their entirety and to not rely on any single financial measure.

Management notes that the use of non-GAAP measures has limitations, including but not limited to:

First, non-GAAP financial measures are not standardized. Accordingly, the methodology used to produce the Company's non-GAAP financial measures is not computed under GAAP and may differ notably from the methodology used by other companies. For example, the Company's non-GAAP measure of adjusted EBITDA may not be directly comparable to EBITDA or an adjusted EBITDA measure reported by other companies.

Second, the Company's non-GAAP financial measures exclude items such as amortization and depreciation that are recurring. Amortization of intangibles and depreciation have been, and will continue to be for the foreseeable future, significant recurring expenses with an impact upon the Company's results of operations, notwithstanding the lack of immediate impact upon cash flows.

Third, there is no assurance that the Company will not have future charges for fair value write-up of acquired inventory, restructuring activities, deal and transaction costs, integration costs, loss on extinguishment of debt or similar items and, therefore, may need to record additional charges (or credits) associated with such items, including the tax effects thereon. The exclusion of these items in the Company's non-GAAP measures should not be construed as an implication that these costs are unusual, infrequent or non-recurring.

Management considers these limitations by providing specific information regarding the GAAP amounts excluded from these non-GAAP financial measures and evaluating these non-GAAP financial measures together with their most directly comparable financial measures calculated in accordance with GAAP. The calculations of adjusted EBITDA, adjusted operating income, and non-GAAP EPS, and reconciliations between these financial measures and their most directly comparable GAAP equivalents, are presented below in the accompanying tables.

The reconciliation of GAAP measures to adjusted operating income and adjusted EBITDA for the years ended December 31, 2022 and 2021 are presented below:

<i>(In thousands)</i>	2022	2021
Net sales	\$ 3,282,033	\$ 2,298,893
Net income	\$ 208,920	\$ 409,126
Net income - as a % of net sales	6.4 %	17.8 %
Adjustments to net income		
Income tax expense	38,160	69,950
Interest expense	212,669	41,240
Interest income	(3,694)	(243)
Other expense, net	23,926	31,695
GAAP – Operating income	479,981	551,768
Operating margin - as a % of net sales	14.6 %	24.0 %
Charge for fair value write-up of acquired inventory sold	61,932	428
Deal and transaction costs	39,543	4,744
Integration costs	50,731	3,780
Contractual and non-cash integration costs	61,964	—
Severance and restructuring costs	—	529
Gain on sale of subsidiary	(254)	—
Amortization of intangible assets	143,953	47,856
Adjusted operating income	837,850	609,105
Adjusted operating margin	25.5 %	26.5 %
Depreciation	135,371	90,311
Adjusted EBITDA	\$ 973,221	\$ 699,416
Adjusted EBITDA – as a % of net sales	29.7 %	30.4 %

The reconciliation of GAAP measures to non-GAAP earnings per share for the years ended December 31, 2022 and 2021 are presented below:

(In thousands, except per share data)

	2022	2021
Net income	\$ 208,920	\$ 409,126
Adjustments to net income:		
Charge for fair value write-up of acquired inventory sold	61,932	428
Deal and transaction costs	39,543	4,744
Integration costs	50,731	3,780
Contractual and non-cash integration costs	61,964	—
Severance and restructuring costs	—	529
Loss on debt extinguishment and modification	3,287	23,338
Interest expense, net	29,822	—
Gain on sale of subsidiary	(254)	—
Amortization of intangible assets	143,953	47,856
Tax effect of adjustments to net income and discrete tax items ⁽¹⁾	(65,728)	(20,411)
Non-GAAP net income	\$ 534,170	\$ 469,390
Diluted earnings per common share	\$ 1.46	\$ 3.00
Effect of adjustments to net income	\$ 2.27	\$ 0.44
Diluted non-GAAP earnings per common share	\$ 3.73	\$ 3.44
Diluted weighted average shares outstanding	143,146	136,574

¹The tax effect of pre-tax adjustments to net income was calculated using the applicable marginal tax rate for each respective year.

Item 7A. Quantitative and Qualitative Disclosure About Market Risks.

Entegris' principal financial market risks are sensitivities to interest rates and foreign currency exchange rates. The Company's interest-bearing cash and cash equivalents and variable rate debt are subject to interest rate fluctuations. The Company's cash and cash equivalents include cash on hand and highly liquid debt securities with original maturities of three months or less. A 100-basis point change in interest rates would potentially increase or decrease annual net income by approximately \$15.5 million and \$2.6 million annually for the years ended December 31, 2022 and 2021, respectively. On July 28, 2022, the Company entered into a floating-to-fixed interest rate swap agreement to hedge the variability in SOFR-based interest payments associated with \$1.95 billion of its \$2.495 billion Initial Term Loan Facility. The notional amount is scheduled to decrease quarterly and will expire on December 30, 2025.

The cash flows and results of operations of the Company's foreign-based operations are subject to fluctuations in foreign currency exchange rates. Approximately 22.7% and 23.5% of the Company's sales during 2022 and 2021 were collectively denominated in the South Korean won, New Taiwan dollar, Chinese renminbi, Canadian dollar, Malaysian ringgit, Singapore dollar, euro, Israeli shekel and the Japanese yen. Financial results therefore will be affected by changes in currency exchange rates. If all foreign currencies were to see a 10% reduction versus the U.S. dollar during the years ended December 31, 2022 and 2021, revenue would be negatively impacted by approximately \$62.6 million and \$52.4 million, respectively.

The Company occasionally uses derivative financial instruments to manage the foreign currency exchange rate risks associated with its foreign-based operations. However, we are unlikely to be able to hedge these exposures completely. We do not enter into forward contracts or other derivative instruments for speculative or trading purposes. See Note 12 of the consolidated financials for additional information.

Item 8. Financial Statements and Supplementary Data.

The information called for by this item is set forth in the Consolidated Financial Statements covered by the Report of Independent Registered Public Accounting Firm at the end of this report.

Item 9. Changes in and Disagreements with Accountants on Accounting and Financial Disclosure.

Not applicable.

Item 9A. Controls and Procedures.

Evaluation of Disclosure Controls and Procedures

Based on management's evaluation (with the participation of our principal executive officer and principal financial officer), as of the end of the period covered by this report, our principal executive officer and principal financial officer have concluded that our disclosure controls and procedures (as defined in Rules 13a-15(e) and 15d-15(e) under the Exchange Act), are effective to provide reasonable assurance that information required to be disclosed by us in reports that we file or submit under the Exchange Act is recorded, processed, summarized, and reported within the time periods specified in SEC rules and forms, and is accumulated and communicated to management, including our principal executive officer and principal financial officer, as appropriate, to allow timely decisions regarding required disclosure.

Changes in Internal Control Over Financial Reporting

There were no changes to our internal control over financial reporting (as defined in Rules 13a-15(f) and 15d-15(f) under the Exchange Act) that occurred during the quarter ended December 31, 2022 that have materially affected, or are reasonably likely to materially affect, our internal control over financial reporting.

Management Report on Internal Control Over Financial Reporting

Our management is responsible for establishing and maintaining adequate internal control over financial reporting (as defined in Rules 13a-15(f) and 15d-15(f) under the Exchange Act) to provide reasonable assurance regarding the reliability of our financial reporting and the preparation of consolidated financial statements for external purposes in accordance with GAAP.

Management assessed our internal control over financial reporting as of December 31, 2022. Management based its assessment on criteria established in Internal Control-Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission (2013 framework). Management's assessment included evaluation of elements such as the design and operating effectiveness of key financial reporting controls, process documentation, accounting policies, and our overall control environment.

As discussed in Note 3 to the consolidated financial statements included in this Annual Report on Form 10-K, the Company completed its acquisition of CMC Materials on July 6, 2022. As permitted by interpretive guidance for newly acquired businesses issued by the SEC Staff, management has excluded total assets of approximately \$6,540.2 million and net sales of approximately \$581.0 million related to CMC Materials that are included in the consolidated financial statements of Entegris and its subsidiaries as of and for the year ended December 31, 2022. Since the date of the acquisition of CMC Materials, CMC Materials' financial results are included in the Company's consolidated financial statements. As part of our post-closing integration activities, we are engaged in the process of assessing the internal controls. The Company has begun to integrate policies, processes, people, technology and operations for the post acquisition combined company, and it will continue to evaluate the impact of any related changes to internal control over financial reporting.

Based on its assessment, management has concluded that our internal control over financial reporting was effective as of the end of the fiscal year to provide reasonable assurance regarding the reliability of financial reporting and the preparation of consolidated financial statements for external reporting purposes in accordance with GAAP. We reviewed the results of management's assessment with the Audit Committee of our board of directors.

KPMG LLP, the independent registered public accounting firm which audited the consolidated financial statements included in this annual report, has issued an attestation report on our internal control over financial reporting.

Inherent Limitations on Effectiveness of Controls

Our management, including our principal executive officer and principal financial officer, does not expect that our disclosure controls and procedures or our internal control over financial reporting will prevent or detect all errors and all fraud. A control system, no matter how well-designed and operated, can provide only reasonable, not absolute, assurance that the control system's objectives will be met. The design of a control system must reflect the fact that there are resource constraints, and the benefits of controls must be considered relative to their costs. Further, because of the inherent limitations in all control systems, no evaluation of controls can provide absolute assurance that misstatements due to error or fraud will not occur or that all control issues and instances of fraud, if any, have been detected.

Report of Independent Registered Public Accounting Firm

To the Stockholders and Board of Directors
Entegris, Inc.:

Opinion on Internal Control Over Financial Reporting

We have audited Entegris, Inc. and subsidiaries' (the Company) internal control over financial reporting as of December 31, 2022, based on criteria established in Internal Control – Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission. In our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 31, 2022, based on criteria established in Internal Control – Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the consolidated balance sheets of the Company as of December 31, 2022 and 2021, the related consolidated statements of operations, comprehensive income, equity, and cash flows for each of the years in the three-year period ended December 31, 2022, and the related notes (collectively, the consolidated financial statements), and our report dated February 22, 2023 expressed an unqualified opinion on those consolidated financial statements.

The Company acquired CMC Materials, Inc. and subsidiaries (CMC Materials) during 2022, and management excluded from its assessment of the effectiveness of the Company's internal control over financial reporting as of December 31, 2022 CMC Material's internal control over financial reporting associated with total assets of \$6,540.2 million and total revenues of \$581.0 million included in the consolidated financial statements of the Company as of and for the year ended December 31, 2022. Our audit of internal control over financial reporting of the Company also excluded an evaluation of the internal control over financial reporting of CMC Materials.

Basis for Opinion

The Company's management is responsible for maintaining effective internal control over financial reporting and for its assessment of the effectiveness of internal control over financial reporting, included in the accompanying Management Report on Internal Control Over Financial Reporting. Our responsibility is to express an opinion on the Company's internal control over financial reporting based on our audit. We are a public accounting firm registered with the PCAOB and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audit in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether effective internal control over financial reporting was maintained in all material respects. Our audit of internal control over financial reporting included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, and testing and evaluating the design and operating effectiveness of internal control based on the assessed risk. Our audit also included performing such other procedures as we considered necessary in the circumstances. We believe that our audit provides a reasonable basis for our opinion.

Definition and Limitations of Internal Control Over Financial Reporting

A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal control over financial reporting includes those policies and procedures that (1) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (2) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (3) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

Minneapolis, Minnesota
February 22, 2023

Item 9B. Other Information.

None.

Item 9C. Disclosure Regarding Foreign Jurisdictions that Prevent Inspections.

Not Applicable.

PART III

Item 10. Directors, Executive Officers and Corporate Governance.

Except as set forth below, the information required by this Item 10 has been omitted from this report, and is incorporated by reference to our Definitive Proxy Statement for the Entegris, Inc. Annual Meeting of Stockholders, which is currently scheduled to be held on April 26, 2023, and to be filed with the Securities and Exchange Commission pursuant to Regulation 14A within 120 days after the end of our 2022 fiscal year.

In 2005, our board of directors adopted a code of business ethics, The Entegris, Inc. Code of Business Ethics, applicable to all of our executives, directors and employees, as well as a set of corporate governance guidelines, which have been updated from time to time. The Entegris, Inc. Code of Business Ethics, the Corporate Governance Guidelines and the charters for our Audit & Finance Committee, Governance & Nominating Committee and our Management Development & Compensation Committee all appear on our website at <http://www.Entegris.com> under “Investor Relations - Corporate Governance”. The Entegris, Inc. Code of Business Ethics, Corporate Governance Guidelines and committee charters are also available in print to any shareholder that requests a copy. Copies may be obtained by contacting our Secretary through our corporate headquarters. The Company intends to comply with the requirements of Item 5.05 of Form 8-K with respect to any amendment to or waiver of the provisions of the Entegris, Inc. Code of Business Ethics applicable to the registrant’s Chief Executive Officer, Chief Financial Officer, Chief Accounting Officer or Controller by posting notice of any such amendment or waiver at the same location on our website.

INFORMATION ABOUT OUR EXECUTIVE OFFICERS

The following is a list of our Executive Officers, their ages and their offices, as of the date of this Annual Report on Form 10-K.

<u>Name</u>	<u>Age</u>	<u>Office</u>
Bertrand Loy	57	<i>President & Chief Executive Officer</i>
Gregory B. Graves	62	<i>Executive Vice President, Chief Financial Officer and Treasurer</i>
Sue Rice	64	<i>Senior Vice President, Global Human Resources</i>
Joe Colella	41	<i>Senior Vice President, General Counsel and Secretary</i>
Jim O’Neill	58	<i>Senior Vice President and Chief Technology Officer</i>
Olivier Blachier	49	<i>Senior Vice President, Business and New Markets Development</i>
Stuart Tison	59	<i>Senior Vice President and President, Specialty Chemicals and Engineered Materials</i>
Clint Haris	50	<i>Senior Vice President and President, Microcontamination Control</i>
William Shaner	55	<i>Senior Vice President and President, Advanced Materials Handling</i>
Daniel Woodland	52	<i>Senior Vice President and President, Advanced Planarization Solutions</i>
Michael Besnard	52	<i>Senior Vice President and Chief Commercial Officer</i>
Neil Richards	50	<i>Senior Vice President, Global Operations, Supply Chain, and Quality</i>
Bruce W. Beckman	55	<i>Senior Vice President, Finance</i>
Michael D. Sauer	57	<i>Vice President, Controller & Chief Accounting Officer</i>

Bertrand Loy has been our Chief Executive Officer, President and a director since November 2012. From July 2008 to November 2012, he served as our Executive Vice President and Chief Operating Officer. From August 2005 until July 2008, he served as our Executive Vice President in charge of our information technology, global supply chain and manufacturing operations. He served as the Vice President and Chief Financial Officer of Mykrolis, a company spun out of Millipore Corporation, a life science products company, from January 2001 until August 2005. Prior to that, Mr. Loy served as the Chief Information Officer of Millipore Corporation during 1999 and 2000, and previously served in various strategic planning, global

supply chain and financial roles with Millipore and Sandoz Pharmaceuticals (now Novartis), a pharmaceutical company. He has served on the board of directors of Harvard Bioscience, Inc. (scientific equipment) since November 2014 and is now its lead independent director. Since July 2013, Mr. Loy has also been on the board of directors of SEMI, the global industry association representing the electronics manufacturing supply chain, serving as the chairman of the association until December 2022.

Gregory B. Graves has served as our Executive Vice President and Chief Financial Officer since July 2008. Prior to that, he served as Senior Vice President and Chief Financial Officer since April 2007. Prior to April 2007, he served as Senior Vice President, Strategic Planning & Business Development since the effectiveness of the merger with Mykrolis in August 2005. Mr. Graves served as the Chief Business Development Officer of Entegris Minnesota starting in September 2002 and from September 2003 until August 2004 he also served as Senior Vice President of Finance. Prior to joining Entegris Minnesota in September 2002, Mr. Graves held positions in investment banking and corporate development, including at U.S. Bancorp Piper Jaffray from June 1998 to August 2002 and at Dain Rauscher from October 1996 to May 1998. Mr. Graves has served as a director of Laird Superfood, Inc. (a plant-based food company) since September 2018, and was a member of the board of directors of Plug Power Inc. (an energy solutions provider) from May 2017 to June 2019. In 2022, Mr. Graves joined the board of directors of Skywater Technologies, Inc., a semiconductor manufacturer.

Sue Rice has been our Senior Vice President of Global Human Resources since September 2017. Prior to that, Ms. Rice served as Senior Vice President and Chief Human Resources Officer for Thermo Fisher Scientific, a scientific equipment company, from 2013 to 2017, Region Vice President HR Asia Pacific & Emerging Markets from 2009 to 2013 and Group Vice President, HR Analytical Technologies Group from 2006 to 2009. Prior to that, Ms. Rice held senior human resource positions with Fidelity Human Resources Services Company and Sherbrooke Associates.

Joe Colella has been our Senior Vice President, General Counsel and Secretary since April 2020. Previously, Mr. Colella served as our Vice President, Deputy General Counsel from December 2018 until April 2020, Assistant General Counsel from April 2018 until December 2018 and Senior Corporate Counsel from December 2013 until April 2018. Prior to joining Entegris, Mr. Colella served as an associate at an international law firm from 2007 until 2013.

Jim O'Neill has been our Senior Vice President and Chief Technology Officer since September 2019, having previously served as our Vice President, Chief Technology Officer since April 2014 when he joined Entegris as part of our acquisition of ATMI. At ATMI, Dr. O'Neill was Senior Vice President of Electronic Materials from January 2012 to April 2014. Prior to that, he held numerous technical and leadership roles in semiconductor research and development with over 23 years at IBM.

Olivier Blachier has been our Senior Vice President, Business and New Markets Development since November 2021 and is responsible for the company's merger and acquisition activities and for the commercialization of emerging businesses. Before joining Entegris, Mr. Blachier held various senior leadership positions between 2007 and 2021 at Air Liquide Group, a global leader in gases, technologies, and services for the industrial and healthcare sectors. From 1997 to 2007, Mr. Blachier worked for Edwards, Ltd., a global vacuum and abatement process leader and subsidiary of BOC Group, where he held multiple roles in the U.S. and U.K., including leading multiple acquisitions and joint ventures.

Stuart Tison has been our Senior Vice President and President, Specialty Chemicals and Engineered Materials since July 2022, having served as our Senior Vice President and General Manager, Specialty Chemicals and Engineered Materials since July 2016. Prior to that, Mr. Tison served as Vice President, Specialty Gas Solutions since February 2015, as Vice President, Business Development since January 2010 and as Vice President, Corporate Development since July 2007. Prior to that, he served Celerity, Inc. as Vice President, Engineering and served Entegris predecessor companies Mykrolis and Millipore in a variety of sales, marketing, business development and engineering roles.

Clint Haris has been our Senior Vice President and President, Microcontamination Control since July 2022, having served as our Senior Vice President and General Manager, Microcontamination Control since July 2016. Prior to that, Mr. Haris served as our Vice President, Liquid Microcontamination Control since August 2014. Prior to joining Entegris, Mr. Haris served in a variety of executive roles at Brooks Automation Inc. including Senior Vice President, Life Science Systems from 2010 to 2014 and Senior Vice President and General Manager, Systems Solutions from 2009 to 2010.

William Shaner has been our Senior Vice President and President, Advanced Materials Handling since July 2022, having served as our Senior Vice President and General Manager, Advanced Materials Handling since July 2016. Prior to that, Mr. Shaner served as our Senior Vice President, Global Operations since February 2014 and, prior to that, as our Vice President and General Manager, Microenvironments division since 2007. He has served in a variety of sales, marketing, business development and engineering roles since joining Entegris in 1995.

Daniel Woodland joined Entegris in 2022 as part of the acquisition of CMC Materials. Mr. Woodland serves as Senior Vice President and President, Advanced Planarization Solutions, a newly formed fourth division announced upon acquisition close. Prior to joining Entegris, Mr. Woodland served several roles at CMC Materials (previously Cabot Microelectronics) since 2003, including as Vice President and President, Electronic Materials from 2019 to 2022, Vice President and Chief Marketing and Operations Officer from 2017 to 2019, and Vice President of Marketing from 2015 to 2017.

Michael Besnard has been our Senior Vice President and Chief Commercial Officer since 2016. Prior to that, Mr. Besnard served as Vice President of Global Strategic Accounts since 2014. Prior to joining Entegris, Mr. Besnard served ATMI as the vice president of global strategic accounts and MacDermid Enthone (previously Enthone) as director of business development for Copper Plating.

Neil Richards has been our Senior Vice President, Global Operations, Supply Chain, and Quality since September 2019. Prior to that, Mr. Richards served as Vice President of Operations for the company's Specialty Chemicals and Engineered Materials division since 2016. Prior to joining Entegris, Mr. Richards held several positions with the BOC Group, which merged with Linde in 2006.

Bruce W. Beckman has been our Senior Vice President, Finance since February 2018. Prior to that, Mr. Beckman served as Vice President, Finance since joining Entegris in April 2015. From 1990 to 2015, Mr. Beckman worked in numerous capacities for General Mills, Inc., including Vice President, Finance, Meals Division from July 2012 to January 2015, Director of Corporate Planning & Analysis from July 2008 to July 2012 and Director of Internal Controls from 2003 to 2005.

Michael D. Sauer has been our Vice President, Controller and Chief Accounting Officer since June 2012. Prior to that, he served as the Corporate Controller since 2008. From the time of the merger with Mykrolis in August 2005 until April 2008, Mr. Sauer served as Director of Treasury and Risk Management. Mr. Sauer joined Fluoroware, Inc., a predecessor to Entegris Minnesota in 1988 and held a variety of finance and accounting positions until 2001 when he became the Director of Business Development for Entegris Minnesota, the successor to Fluoroware, serving in that position until the merger with Mykrolis.

Item 11. Executive Compensation.

The information required by this Item 11 has been omitted from this report, and is incorporated by reference to our Definitive Proxy Statement for the Entegris, Inc. Annual Meeting of Stockholders to be held on April 26, 2023, and to be filed with the Securities and Exchange Commission pursuant to Regulation 14A within 120 days after the end of our 2022 fiscal year.

Item 12. Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters.

Securities Authorized for Issuance Under Equity Compensation Plans:

As of December 31, 2022, our equity compensation plan information is as follows:

Equity Compensation Plan Information

Plan category	Number of securities to be issued upon exercise of outstanding options, warrants and rights (a)	Weighted-average exercise price of outstanding options, warrants and rights ⁽¹⁾ (b)	Number of securities remaining available for future issuance under equity compensation plans (excluding securities reflected in column (a)) ^{(2) (3)} (c)
Equity compensation plans approved by security holders	3,075,996	\$ 54.53	12,141,458
Equity compensation plans not approved by security holders	—	—	—
Total	3,075,996	\$ 54.53	12,141,458

- (1) The weighted average exercise price does not take into account the shares issuable upon vesting of outstanding restricted stock units, which have no exercise price.
- (2) These shares are available for future issuance under the 2020 Stock Plan in the form of stock options, restricted stock units, performance shares and other stock awards in accordance with the terms of the 2020 Stock Plan.
- (3) Includes 1,284,523 shares remaining available for future issuance under the Company's Employee Stock Purchase Plan as of December 31, 2022.

The other information required by this Item 12 has been omitted from this report, and is incorporated by reference to our Definitive Proxy Statement for the Entegris, Inc. Annual Meeting of Stockholders to be held on April 26, 2023, and to be filed with the Securities and Exchange Commission pursuant to Regulation 14A within 120 days after the end of our 2022 fiscal year.

Item 13. Certain Relationships and Related Transactions, and Director Independence.

The information required by this Item 13 has been omitted from this report, and is incorporated by reference to our Definitive Proxy Statement for the Entegris, Inc. Annual Meeting of Stockholders to be held on April 26, 2023, and to be filed with the Securities and Exchange Commission pursuant to Regulation 14A within 120 days after the end of our 2022 fiscal year.

Item 14. Principal Accountant Fees and Services.

The information required by this Item 14 has been omitted from this report, and is incorporated by reference to our Definitive Proxy Statement for the Entegris, Inc. Annual Meeting of Stockholders to be held on April 26, 2023, and to be filed with the Securities and Exchange Commission pursuant to Regulation 14A within 120 days after the end of our 2022 fiscal year.

PART IV

Item 15. Exhibits and Financial Statement Schedules.

(a) The following Financial Statements are included in Item 8 herein:

1. Financial Statements:

Report of Independent Registered Public Accounting Firm
 Consolidated Balance Sheets at December 31, 2022 and 2021
 Consolidated Statements of Operations for the Years Ended December 31, 2022, 2021 and 2020
 Consolidated Statements of Comprehensive Income for the Years Ended December 31, 2022, 2021 and 2020
 Consolidated Statements of Equity for the Years Ended December 31, 2022, 2021 and 2020
 Consolidated Statements of Cash Flows for the Years Ended December 31, 2022, 2021 and 2020
 Notes to Consolidated Financial Statements

2. Financial Statement Schedule - All financial statement schedules have been omitted since the information is either not applicable or is included in the consolidated financial statements notes thereof.

3. Exhibits - The following exhibits are incorporated by reference into this Annual Report on Form 10-K:

Reg. S-K Item 601(b) Reference	Document Incorporated	Referenced Document on file with the Commission
(2)	<u>Agreement and Plan of Merger, dated as of December 14, 2021, by and among Entegris, Inc., CMC Materials, Inc. and Yosemite Merger Sub, Inc.</u>	Exhibit 2.1 to Entegris, Inc. Current Report on Form 8-K filed with the Securities and Exchange Commission on December 16, 2021
(3)	<u>Amended and Restated Certificate of Incorporation of Entegris, Inc., as amended</u>	Exhibit 3.1 to Entegris, Inc. Annual Report on Form 10-K for the fiscal year ended December 31, 2011
(3)	<u>By-Laws of Entegris, Inc., as amended December 8, 2022</u>	Exhibit 3.1 to Entegris, Inc. Current Report on Form 8-K filed with the Securities and Exchange Commission on December 9, 2022
(4)	<u>Form of certificate representing shares of Common Stock, \$.01 par value per share</u>	Exhibit 4.1 to Form S-4 Registration Statement of Entegris, Inc. and Eagle DE, Inc. (No. 333-124719)
(4)	<u>Indenture, dated as of April 30, 2020, by and among the Company, certain subsidiaries of the Company and Wells Fargo Bank, National Association, as trustee, including the form of note representing the 2028 Notes</u>	Exhibit 4.1 to Entegris, Inc. Current Report on Form 8-K filed with the Securities and Exchange Commission on April 30, 2020
(4)	<u>Indenture, dated as of April 30, 2021, by and among the Company, certain subsidiaries of the Company and Wells Fargo Bank, National Association, as trustee, including the form of note representing the 2029 Notes</u>	Exhibit 4.1 to Entegris, Inc. Current Report on Form 8-K filed with the Securities and Exchange Commission on April 30, 2021
(4)	<u>Indenture, dated as of April 14, 2022, by and among Entegris Escrow Corporation, as escrow issuer and Truist Bank, as trustee and notes collateral agent, including the form of note issuable thereunder</u>	Exhibit 4.1 to Entegris, Inc. Current Report on Form 8-K filed with the Securities and Exchange Commission on April 14, 2022
(4)	<u>Indenture, dated as of June 30, 2022, by and among Entegris and Truist Bank, as trustee, including the form of note representing the Unsecured Notes</u>	Exhibit 4.1 to Entegris, Inc. Current Report on Form 8-K filed with the Securities and Exchange Commission on June 30, 2022
(4)	<u>Supplemental Indenture to the 2029 Secured Notes Indenture, dated as of July 6, 2022, by and among Entegris, certain subsidiaries of Entegris and Truist Bank, as trustee and notes collateral agent</u>	Exhibit 4.3 to Entegris, Inc. Current Report on Form 8-K filed with the Securities and Exchange Commission on July 6, 2022
(4)	<u>Supplemental Indenture to the 2030 Unsecured Notes Indenture, dated as of July 6, 2022, by and among Entegris, certain subsidiaries of Entegris and Truist Bank, as trustee.</u>	Exhibit 4.4 to Entegris, Inc. Current Report on Form 8-K filed with the Securities and Exchange Commission on July 6, 2022

(4)	<u>Equal Priority Intercreditor Agreement, dated as of July 6, 2022, among Entegris, certain subsidiaries of Entegris, Morgan Stanley Senior Funding, Inc., as senior credit facilities collateral agent, and Truist Bank, as notes collateral agent.</u>	Exhibit 4.5 to Entegris, Inc. Current Report on Form 8-K filed with the Securities and Exchange Commission on July 6, 2022
(4)	<u>Supplemental Indenture to the 2028 Notes Indenture, dated as of July 6, 2022, by and among Entegris, certain subsidiaries of Entegris and Computershare Trust Company, National Association, as successor to Wells Fargo Bank, National Association, as trustee.</u>	Exhibit 4.7 to Entegris, Inc. Current Report on Form 8-K filed with the Securities and Exchange Commission on July 6, 2022
(4)	<u>Supplemental Indenture to the 2029 Notes Indenture, dated as of July 6, 2022, by and among Entegris, certain subsidiaries of Entegris and Computershare Trust Company, National Association, as successor to Wells Fargo Bank, National</u>	Exhibit 4.9 to Entegris, Inc. Current Report on Form 8-K filed with the Securities and Exchange Commission on July 6, 2022
(4)	<u>Indenture, dated as of June 30, 2022, by and among Entegris Escrow Corporation, as escrow issuer and Truist Bank, as trustee, including the form of note issuable thereunder.</u>	Exhibit 4.1 to Entegris, Inc. Current Report on Form 8-K filed with the Securities and Exchange Commission on June 30, 2022
(4)	<u>Amendment and Restatement Agreement, dated as of July 6, 2022, among Entegris, as borrower, certain subsidiaries of Entegris, as guarantors, the lenders party thereto, the issuing banks party thereto and Morgan Stanley Senior Funding, Inc., as administrative agent and collateral agent.</u>	Exhibit 4.10 to Entegris, Inc. Current Report on Form 8-K filed with the Securities and Exchange Commission on July 6, 2022
(4)	<u>364-Day Bridge Credit and Guaranty Agreement, dated as of July 6, 2022, among Entegris, as borrower, certain subsidiaries of Entegris, as guarantors, the lenders party thereto and Morgan Stanley Senior Funding, Inc., as administrative agent.</u>	Exhibit 4.11 to Entegris, Inc. Current Report on Form 8-K filed with the Securities and Exchange Commission on July 6, 2022
(4)	<u>Amendment Number 1 to the CMC Materials, Inc. 2021 Omnibus Incentive Plan</u>	Exhibit 4.3 to Entegris, Inc. Registration Statement on Form S-8 filed with the Securities and Exchange Commission on July 7, 2022
(4)	<u>Description of Capital Stock</u>	Exhibit 4.1 to Entegris, Inc. Annual Report on Form 10-K filed with the Securities and Exchange Commission on February 7, 2020
(10)	<u>CMC Materials, Inc. 2021 Omnibus Incentive Plan</u>	Exhibit 10.1 to Entegris Registration Statement on Form S-3 filed with the Securities and Exchange Commission on July 7, 2022
(10)	<u>Cabot Microelectronics Corporation 2012 Omnibus Incentive Plan</u>	Exhibit 10.2 to Entegris Registration Statement on Form S-3 filed with the Securities and Exchange Commission on July 7, 2022
(10)	<u>Entegris, Inc. – 2010 Stock Plan, as amended*</u>	Exhibit 10.1 to Entegris, Inc. Quarterly Report on Form 10-Q for the period ended July 3, 2010
(10)	<u>Entegris, Inc. 2020 Stock Plan*</u>	Annex 1 to the Entegris, Inc. Schedule 14A proxy statement for its 2020 Annual Meeting of Stockholders (No. 001-32598), as filed with the Securities and Exchange Commission on March 18, 2020
(10)	<u>Entegris, Inc. Outside Directors' Stock Option Plan*</u>	Exhibit 10.2 to Entegris, Inc. Registration Statement on Form S-1 (No. 333-33668)
(10)	<u>Entegris, Inc. Amended and Restated Employee Stock Purchase Plan*</u>	Exhibit 4.1 to Entegris, Inc. Registration Statement on Form S-8 (No. 333-211444)
(10)	<u>Second Amended and Restated Entegris Incentive Plan*</u>	Exhibit 10.1 to Entegris, Inc. Current Report on Form 8-K filed with the Securities and Exchange Commission on May 24, 2017
(10)	<u>Entegris, Inc. 2007 Deferred Compensation Plan*</u>	Exhibit 10.2 to Entegris, Inc. Quarterly Report on Form 10-Q for the fiscal period ended June 30, 2007

(10)	<u>Amended and Restated Supplemental Executive Retirement Plan for Key Salaried Employees*</u>	Exhibit 10.2 to Entegris, Inc. Annual Report on Form 10-K for the fiscal year ended December 31, 2008
(10)	<u>Amendment to Amended and Restated SERP*</u>	Exhibit 10.15 to Entegris, Inc. Annual Report on Form 10-K for the fiscal year ended December 31, 2009
(10)	<u>Lease Agreement, dated April 1, 2002 between Nortel Networks HPOCS Inc. and Mykrolis Corporation, relating to Executive office, R&D and manufacturing facility located at 129 Concord Road Billerica, MA</u>	Exhibit 10.1.3 to Mykrolis Corporation's Quarterly Report on Form 10-Q for the quarter ended March 31, 2002
(10)	<u>Amendment of Lease between Entegris, Inc. and KBS Rivertech, LLC dated April 1, 2012</u>	Exhibit 10.1 to Entegris, Inc. Quarterly Report on Form 10-Q for the period ended June 30, 2012
(10)	<u>Second Amendment of Lease, dated March 8, 2016, between Entegris, Inc. and KBS Rivertech, LLC</u>	Exhibit 10.1 to Entegris, Inc. Current Report on Form 8-K filed with the Securities and Exchange Commission on March 11, 2016
(10)	<u>Third Amendment to Lease Agreement, dated as of October 21, 2021, between Entegris, Inc. and Rivertech Owner LLC</u>	Exhibit 10.4 to Entegris, Inc. Annual Report on Form 10-K for the fiscal year ended December 31, 2021
(10)	<u>Fourth Amendment to Lease Agreement, dated as of September 16, 2022, by and between the Company and Rivertech Owner LLC</u>	Exhibit 10.1 to Entegris, Inc. Quarterly Report on Form 10-Q for the period ended October 1, 2022
(10)	<u>Fluoropolymer Purchase and Sale Agreement, by and between E.I. Du Pont De Nemours and Company and the Registrant, dated January 1, 2011, as amended</u>	Exhibit 10.2 to Entegris, Inc. Quarterly Report on Form 10-Q for the quarter ended April 2, 2011
(10)	<u>Form of Indemnification Agreement between Entegris, Inc. and each of its executive officers and Directors</u>	Exhibit 10.30 to Entegris, Inc. Annual Report on Form 10-K for the fiscal year ended August 27, 2005
(10)	<u>Form of Executive Change of Control Termination Agreement between Entegris, Inc. and certain of its executive officers*</u>	Exhibit 10.31 to Entegris, Inc. Annual Report on Form 10-K for the fiscal year ended August 27, 2005
(10)	<u>Form of Revised Executive Change of Control Termination Agreement between Entegris, Inc. and certain of its executive officers executed in 2015 (other than those executive officers who executed the form previously filed)*</u>	Exhibit 10.1 to Entegris, Inc. Annual Report on Form 10-K filed with the Securities and Exchange Commission on February 29, 2016
(10)	<u>Entegris, Inc. 2016 Stock Option Grant Agreement*</u>	Exhibit 10.4 to Entegris, Inc. Annual Report on Form 10-K filed with the Securities and Exchange Commission on February 17, 2017
(10)	<u>Entegris, Inc. 2017 Stock Option Grant Agreement*</u>	Exhibit 10.3 to Entegris, Inc. Annual Report on Form 10-K filed with the Securities and Exchange Commission on February 15, 2018
(10)	<u>Entegris, Inc. 2018 Stock Option Grant Agreement*</u>	Exhibit 10.3 to Entegris, Inc. Annual Report on Form 10-K filed with the Securities and Exchange Commission on February 11, 2019
(10)	<u>Entegris, Inc. 2019 RSU Award Agreement*</u>	Exhibit 10.2 to Entegris, Inc. Annual Report on Form 10-K filed with the Securities and Exchange Commission on February 7, 2020
(10)	<u>Entegris, Inc. 2019 Stock Option Grant Agreement*</u>	Exhibit 10.3 to Entegris, Inc. Annual Report on Form 10-K filed with the Securities and Exchange Commission on February 7, 2020
(10)	<u>Entegris, Inc. 2020 Performance Share Award Agreement (under 2010 Stock Plan)*</u>	Exhibit 10.1 to Entegris, Inc. Quarterly Report on Form 10-Q for the period ended March 28, 2020
(10)	<u>Entegris, Inc. 2020 RSU Award Agreement (under 2010 Stock Plan)*</u>	Exhibit 10.2 to Entegris, Inc. Quarterly Report on Form 10-Q for the period ended March 28, 2020
(10)	<u>Entegris, Inc. 2020 Stock Option Grant Agreement (under 2010 Stock Plan)*</u>	Exhibit 10.3 to Entegris, Inc. Quarterly Report on Form 10-Q for the period ended March 28, 2020

(10)	<u>Entegris, Inc. 2020 RSU Award Agreement (under 2020 Stock Plan)*</u>	Exhibit 10.1 to Entegris, Inc. Annual Report on Form 10-K for the fiscal year ended December 31, 2020
(10)	<u>Entegris, Inc. 2021 Performance Share Award Agreement*</u>	Exhibit 10.2 to Entegris, Inc. Annual Report on Form 10-K for the fiscal year ended December 31, 2020
(10)	<u>Entegris, Inc. 2021 RSU Award Agreement*</u>	Exhibit 10.3 to Entegris, Inc. Annual Report on Form 10-K for the fiscal year ended December 31, 2020
(10)	<u>Entegris, Inc. 2021 Stock Option Grant Agreement*</u>	Exhibit 10.4 to Entegris, Inc. Annual Report on Form 10-K for the fiscal year ended December 31, 2020
(10)	<u>Entegris, Inc. 2022 Performance Share Award Agreement*</u>	Exhibit 10.1 to Entegris, Inc. Annual Report on Form 10-K for the fiscal year ended December 31, 2021
(10)	<u>Entegris, Inc. 2022 RSU Award Agreement*</u>	Exhibit 10.2 to Entegris, Inc. Annual Report on Form 10-K for the fiscal year ended December 31, 2021
(10)	<u>Entegris, Inc. 2022 Stock Option Grant Agreement*</u>	Exhibit 10.3 to Entegris, Inc. Annual Report on Form 10-K for the fiscal year ended December 31, 2021
(10)	<u>Executive Employment Agreement, effective November 28, 2012, between the Registrant and Bertrand Loy*</u>	Exhibit 10.1 to Entegris, Inc. Annual Report on Form 10-K for the fiscal year ended December 31, 2012
(10)	<u>Amendment No. 1, dated April 26, 2013, to Executive Change in Control Termination Agreement, between Entegris, Inc. and Bertrand Loy*</u>	Exhibit 99.1 to Entegris, Inc. Current Report on Form 8-K filed with the Securities and Exchange Commission on April 26, 2013
(10)	<u>Amendment No. 2, dated February 5, 2020, to Executive Change in Control Termination Agreement, between Entegris, Inc. and Bertrand Loy*</u>	Exhibit 10.4 to Entegris, Inc. Annual Report on Form 10-K filed with the Securities and Exchange Commission on February 7, 2020
(10)	<u>Severance Protection Agreement, dated May 13, 2011 between Entegris, Inc. and Gregory B. Graves*</u>	Exhibit 10.2 to Entegris, Inc. Quarterly Report on Form 10-Q for the period ended July 2, 2011
(10)	<u>Amendment No. 1, dated as of February 23, 2016, to the Severance Protection Agreement by and between Entegris, Inc. and Gregory B. Graves*</u>	Exhibit 10.2 to Entegris, Inc. Quarterly Report on Form 10-Q filed with the Securities and Exchange Commission on April 28, 2016
(10)	<u>Separation Agreement and Release, dated as of August 27, 2019, by and between the Company and Gregory Marshall*</u>	Exhibit 10.1 to Entegris, Inc. Quarterly Report on Form 10-Q filed with the Securities and Exchange Commission on October 24, 2019
(10)	<u>Separation Agreement and Release, dated as of September 1, 2022, by and between the Company and Todd Edlund*</u>	Exhibit 10.2 to Entegris, Inc. Quarterly Report on Form 10-Q for the period ended October 1, 2022

* A “management contract or compensatory plan”

The Company hereby files as exhibits to this Annual Report on Form 10-K the following documents:

Reg. S-K

Item 601(b)

Reference	Exhibit No.	Documents Filed Herewith
(10)	10.1	<u>Entegris, Inc 2023 Performance Share Award Agreement *</u>
(10)	10.2	<u>Entegris, Inc 2023 RSU Award Agreement *</u>
(10)	10.3	<u>Entegris, Inc 2023 Stock Option Grant Agreement *</u>
(21)	21	<u>Subsidiaries of Entegris, Inc.</u>
(23)	23	<u>Consent of Independent Registered Public Accounting Firm</u>
(24)	24	<u>Power of Attorney by the Directors of Entegris, Inc.</u>
(31)	31.1	<u>Certification required by Rule 13a-14(a) in accordance with Section 302 of the Sarbanes—Oxley Act of 2002.</u>
(31)	31.2	<u>Certification required by Rule 13a-14(a) in accordance with Section 302 of the Sarbanes—Oxley Act of 2002.</u>
(32)	32.1	<u>Certification required by Rule 13a-14(b) and 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.</u>
(32)	32.2	<u>Certification required by Rule 13a-14(b) and 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.</u>
(101)	101.INS	XBRL Instance Document - the instance document does not appear in the Interactive Data File because its XBRL tags are embedded within the Inline XBRL document
(101)	101.SCH	XBRL Taxonomy Extension Schema Document
(101)	101.CAL	XBRL Taxonomy Extension Calculation Linkbase Document
(101)	101.DEF	XBRL Taxonomy Extension Definition Linkbase Document
(101)	101.LAB	XBRL Taxonomy Extension Label Linkbase Document
(101)	101.PRE	XBRL Taxonomy Extension Presentation Linkbase Document
(104)	104	Cover Page Interactive Data File (formatted as Inline XBRL and contained in Exhibit 101)

* A “management contract or compensatory plan”

Item 16. Form 10-K Summary.

None.

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, the Registrant has duly caused this report to be signed on its behalf by the undersigned thereunto duly authorized.

ENTEGRIS, INC.

Date: February 22, 2023

By /s/ BERTRAND LOY

Bertrand Loy
President & Chief Executive Officer

Pursuant to the requirements of the Securities Exchange Act of 1934, this report has been signed below by the following persons on behalf of the Registrant and in the capacities and on the dates indicated.

<u>SIGNATURE</u>	<u>TITLE</u>	<u>DATE</u>
<u>/s/ BERTRAND LOY</u> Bertrand Loy	President, Chief Executive Officer and Director (Principal executive officer)	February 22, 2023
<u>/s/ GREGORY B. GRAVES</u> Gregory B. Graves	Executive Vice President, Chief Financial Officer & Treasurer (Principal financial officer)	February 22, 2023
<u>/s/ MICHAEL D. SAUER</u> Michael D. Sauer	Vice President, Controller & Chief Accounting Officer (Principal accounting officer)	February 22, 2023
<u>PAUL L.H. OLSON*</u> Paul L.H. Olson	Director, Chairman of the Board	February 22, 2023
<u>MICHAEL A. BRADLEY*</u> Michael A. Bradley	Director	February 22, 2023
<u>RODNEY CLARK*</u> Rodney Clark	Director	February 22, 2023
<u>JAMES F. GENTILCORE*</u> James F. Gentilcore	Director	February 22, 2023
<u>YVETTE KANOUFF*</u> Yvette Kanouff	Director	February 22, 2023
<u>JAMES P. LEDERER*</u> James P. Lederer	Director	February 22, 2023
<u>AZITA SALEKI-GERHARDT*</u> Azita Saleki-Gerhardt	Director	February 22, 2023

*By /s/ Gregory B. Graves
Gregory B. Graves, Attorney-in-fact

ENTEGRIS, INC.
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Report of Independent Registered Public Accounting Firm

To the Stockholders and Board of Directors
Entegris, Inc.:

Opinion on the Consolidated Financial Statements

We have audited the accompanying consolidated balance sheets of Entegris, Inc. and subsidiaries (the Company) as of December 31, 2022 and 2021, the related consolidated statements of operations, comprehensive income, equity, and cash flows for each of the years in the three-year period ended December 31, 2022, and the related notes (collectively, the consolidated financial statements). In our opinion, the consolidated financial statements present fairly, in all material respects, the financial position of the Company as of December 31, 2022 and 2021, and the results of its operations and its cash flows for each of the years in the three-year period ended December 31, 2022, in conformity with U.S. generally accepted accounting principles.

Basis for Opinion

These consolidated financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on these consolidated financial statements based on our audits. We are a public accounting firm registered with the PCAOB and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the consolidated financial statements are free of material misstatement, whether due to error or fraud. Our audits included performing procedures to assess the risks of material misstatement of the consolidated financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the consolidated financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements. We believe that our audits provide a reasonable basis for our opinion.

Critical Audit Matter

The critical audit matter communicated below is a matter arising from the current period audit of the consolidated financial statements that was communicated or required to be communicated to the audit committee and that: (1) relates to accounts or disclosures that are material to the consolidated financial statements and (2) involved our especially challenging, subjective, or complex judgments. The communication of a critical audit matter does not alter in any way our opinion on the consolidated financial statements, taken as a whole, and we are not, by communicating the critical audit matter below, providing a separate opinion on the critical audit matter or on the accounts or disclosures to which it relates.

Fair value of certain acquired developed technology

As discussed in Note 3 to the consolidated financial statements, on July 6, 2022, the Company acquired CMC Materials, Inc. (CMC Materials) in a business combination. The fair value of developed technology acquired was \$1,035.6 million. The fair value of these intangibles was estimated using an income approach, which utilized key assumptions such as future revenue growth rates and a discount rate.

We identified the evaluation of the acquisition date fair value of certain developed technology acquired in the CMC Materials acquisition as a critical audit matter. The estimated fair value was sensitive to changes in certain assumptions. Specifically, a high degree of subjective auditor judgment was required to evaluate the revenue growth rates and the discount rate assumptions. In addition, valuation professionals with specialized skills and knowledge were required to assess the discount rate.

The following are the primary procedures we performed to address the critical audit matter. We evaluated the design and tested the operating effectiveness of certain internal controls related to the Company's acquisition-date valuation process, including controls related to the development of the assumptions noted above. We evaluated the assumed revenue growth rates by comparing them to the historic growth rates of CMC Materials and to industry reports. In addition, we involved

valuation professionals with specialized skills and knowledge, who assisted in evaluating the discount rate by performing an independent analysis using inputs and assumptions and comparing the results to the Company's discount rate.

/s/ KPMG LLP

We or our predecessor firms have served as the Company's auditor since 1966.

Minneapolis, Minnesota
February 22, 2023

ENTEGRIS, INC. AND SUBSIDIARIES
CONSOLIDATED BALANCE SHEETS

(In thousands, except share and per share data)

	December 31, 2022	December 31, 2021
ASSETS		
Current assets:		
Cash and cash equivalents	\$ 561,559	\$ 402,565
Restricted cash	1,880	—
Trade accounts and notes receivable, net	535,485	347,413
Inventories, net	812,815	475,213
Deferred tax charges and refundable income taxes	47,618	35,312
Assets held-for-sale	246,531	—
Other current assets	129,297	52,867
Total current assets	2,335,185	1,313,370
Property, plant and equipment, net	1,393,337	654,098
Other assets:		
Right-of-use assets	94,940	66,563
Goodwill	4,408,331	793,702
Intangible assets, net	1,841,955	335,113
Deferred tax assets and other noncurrent tax assets	28,867	17,671
Other noncurrent assets	36,242	11,379
Total assets	\$ 10,138,857	\$ 3,191,896
LIABILITIES AND EQUITY		
Current liabilities:		
Short-term debt, including current portion of long-term debt	\$ 151,965	\$ —
Accounts payable	172,488	130,734
Accrued payroll and related benefits	142,340	108,818
Accrued interest payable	25,571	6,073
Liabilities held-for-sale	10,637	—
Other accrued liabilities	160,873	84,240
Income taxes payable	98,057	49,136
Total current liabilities	761,931	379,001
Long-term debt, excluding current maturities	5,632,928	937,027
Pension benefit obligations and other liabilities	54,090	37,816
Deferred tax liabilities and other noncurrent tax liabilities	391,192	64,170
Long-term lease liabilities	80,716	60,101
Equity:		
Preferred stock, par value \$.01; 5,000,000 shares authorized; none issued and outstanding as of December 31, 2022 and December 31, 2021	—	—
Common stock, par value \$.01; 400,000,000 shares authorized; issued and outstanding shares as of December 31, 2022: 149,339,486 and 149,137,086, respectively; issued and outstanding shares as of December 31, 2021: 135,719,366 and 135,516,966, respectively	1,493	1,357
Treasury stock, common, at cost: 202,400 shares held as of December 31, 2022 and December 31, 2021	(7,112)	(7,112)
Additional paid-in capital	2,205,325	879,845
Retained earnings	1,031,391	879,776
Accumulated other comprehensive loss	(13,097)	(40,085)
Total equity	3,218,000	1,713,781
Total liabilities and equity	\$ 10,138,857	\$ 3,191,896

See the accompanying notes to consolidated financial statements.

ENTEGRIS, INC. AND SUBSIDIARIES
CONSOLIDATED STATEMENTS OF OPERATIONS

<i>(In thousands, except per share data)</i>	Year ended December 31, 2022	Year ended December 31, 2021	Year ended December 31, 2020
Net sales	\$ 3,282,033	\$ 2,298,893	\$ 1,859,313
Cost of sales	1,885,620	1,239,229	1,009,591
Gross profit	1,396,413	1,059,664	849,722
Selling, general and administrative expenses	543,485	292,408	265,128
Engineering, research and development expenses	228,994	167,632	136,057
Amortization of intangible assets	143,953	47,856	53,092
Operating income	479,981	551,768	395,445
Interest expense	212,669	41,240	48,600
Interest income	(3,694)	(243)	(786)
Other expense (income), net	23,926	31,695	(6,656)
Income before income tax expense	247,080	479,076	354,287
Income tax expense	38,160	69,950	59,318
Net income	\$ 208,920	\$ 409,126	\$ 294,969
Basic net income per common share	\$ 1.47	\$ 3.02	\$ 2.19
Diluted net income per common share	\$ 1.46	\$ 3.00	\$ 2.16
Weighted average shares outstanding			
Basic	142,294	135,411	134,837
Diluted	143,146	136,574	136,266

See the accompanying notes to consolidated financial statements.

ENTEGRIS, INC. AND SUBSIDIARIES
CONSOLIDATED STATEMENTS OF COMPREHENSIVE INCOME

<i>(In thousands)</i>	Year ended December 31, 2022	Year ended December 31, 2021	Year ended December 31, 2020
Net income	\$ 208,920	\$ 409,126	\$ 294,969
Other comprehensive income (loss), net of tax			
Foreign currency translation adjustments	(10,220)	(2,275)	(120)
Pension liability adjustments	1,139	(382)	(49)
Interest rate swap - cash flow hedge, net of tax expense of \$10,520	36,069	—	—
Other comprehensive income (loss)	26,988	(2,657)	(169)
Comprehensive income	\$ 235,908	\$ 406,469	\$ 294,800

See the accompanying notes to consolidated financial statements.

ENTEGRIS, INC. AND SUBSIDIARIES
CONSOLIDATED STATEMENTS OF EQUITY

<i>(In thousands)</i>	Common shares outstanding	Common stock	Treasury shares	Treasury stock	Additional paid-in capital	Retained earnings	Foreign currency translation adjustments	Defined benefit pension adjustments	Interest Rate Swap - Cash flow hedge	Total
Balance at December 31, 2019	134,930	\$ 1,349	202	\$ (7,112)	\$ 842,784	\$ 366,127	\$ (36,468)	\$ (791)	\$ —	\$ 1,165,889
Shares issued under stock plans	997	10	—	—	(16,072)	—	—	—	—	(16,062)
Share-based compensation expense	—	—	—	—	22,920	—	—	—	—	22,920
Repurchase and retirement of common stock	(778)	(8)	—	—	(4,820)	(39,735)	—	—	—	(44,563)
Dividends declared (\$0.32 per share)	—	—	—	—	38	(43,528)	—	—	—	(43,490)
Pension liability adjustment	—	—	—	—	—	—	—	(49)	—	(49)
Foreign currency translation	—	—	—	—	—	—	(120)	—	—	(120)
Net income	—	—	—	—	—	294,969	—	—	—	294,969
Balance at December 31, 2020	135,149	1,351	202	(7,112)	844,850	577,833	(36,588)	(840)	—	1,379,494
Shares issued under stock plans	1,133	11	—	—	8,643	—	—	—	—	8,654
Share-based compensation expense	—	—	—	—	29,884	—	—	—	—	29,884
Repurchase and retirement of common stock	(563)	(5)	—	—	(3,547)	(63,557)	—	—	—	(67,109)
Dividends declared (\$0.32 per share)	—	—	—	—	15	(43,626)	—	—	—	(43,611)
Pension liability adjustment	—	—	—	—	—	—	—	(382)	—	(382)
Foreign currency translation	—	—	—	—	—	—	(2,275)	—	—	(2,275)
Net income	—	—	—	—	—	409,126	—	—	—	409,126
Balance at December 31, 2021	135,719	1,357	202	(7,112)	879,845	879,776	(38,863)	(1,222)	—	1,713,781
Shares issued under stock plans	692	7	—	—	(6,659)	—	—	—	—	(6,652)
Share-based compensation expense	—	—	—	—	66,578	—	—	—	—	66,578
Issuance of common stock in connection with CMC Materials acquisition	12,928	129	—	—	1,265,561	—	—	—	—	1,265,690
Dividends declared (\$0.40 per share)	—	—	—	—	—	(57,305)	—	—	—	(57,305)
Interest Rate Swap - Cash flow hedge	—	—	—	—	—	—	—	—	36,069	36,069
Pension liability adjustment	—	—	—	—	—	—	—	1,139	—	1,139
Foreign currency translation	—	—	—	—	—	—	(10,220)	—	—	(10,220)
Net income	—	—	—	—	—	208,920	—	—	—	208,920
Balance at December 31, 2022	149,339	\$ 1,493	202	\$ (7,112)	\$ 2,205,325	\$ 1,031,391	\$ (49,083)	\$ (83)	\$ 36,069	\$ 3,218,000

See the accompanying notes to consolidated financial statements.

ENTEGRIS, INC. AND SUBSIDIARIES
CONSOLIDATED STATEMENTS OF CASH FLOWS

<i>(In thousands)</i>	Year ended December 31, 2022	Year ended December 31, 2021	Year ended December 31, 2020
Operating activities:			
Net income	\$ 208,920	\$ 409,126	\$ 294,969
Adjustments to reconcile net income to net cash provided by operating activities:			
Depreciation	135,371	90,311	83,430
Amortization	143,953	47,856	53,092
Share-based compensation expense	66,577	29,884	22,920
Charge for fair value mark-up of acquired inventory sold	61,932	428	590
Provision for deferred income taxes	(102,744)	(18,433)	(7,250)
Charge for excess and obsolete inventory	28,896	17,103	15,387
Loss on extinguishment of debt	3,287	23,338	2,378
Other	44,458	(2,428)	500
Changes in operating assets and liabilities, net of effects of acquisitions:			
Trade accounts receivable and notes receivable	(59,643)	(86,766)	(27,461)
Inventories	(203,335)	(168,372)	(50,772)
Accounts payable and other accrued liabilities	4,519	53,577	40,162
Other current assets	(13,641)	2,870	(11,952)
Income taxes payable and refundable income taxes	21,751	(3,292)	28,490
Other	11,982	5,252	2,191
Net cash provided by operating activities	352,283	400,454	446,674
Investing activities:			
Acquisition of property and equipment	(466,192)	(210,626)	(131,752)
Acquisition of business, net of cash acquired	(4,474,925)	(91,942)	(111,912)
Other	(4,592)	4,450	338
Net cash used in investing activities	(4,945,709)	(298,118)	(243,326)
Financing activities:			
Proceeds from revolving credit facility and short-term debt	476,000	101,000	217,000
Payments of revolving credit facility and short-term debt	(341,000)	(101,000)	(217,000)
Proceeds from long-term debt	4,940,753	400,000	400,000
Payments of long-term debt	(145,000)	(550,000)	(251,000)
Payments for debt issuance costs	(99,488)	(5,069)	(3,964)
Payments for debt extinguishment costs	—	(19,080)	—
Payments for dividends	(57,309)	(43,545)	(43,245)
Issuance of common stock from employee stock plans	16,168	24,744	8,738
Taxes paid related to net share settlement of equity awards	(22,820)	(16,090)	(24,800)
Repurchase and retirement of common stock	—	(67,109)	(44,563)
Deferred acquisition payment	—	—	(16,125)
Other	(1,101)	(348)	(2,892)
Net cash provided by (used in) financing activities	4,766,203	(276,497)	22,149
Effect of exchange rate changes on cash, cash equivalents and restricted cash	(11,903)	(4,167)	3,485
Increase (decrease) in cash, cash equivalents and restricted cash	160,874	(178,328)	228,982
Cash, cash equivalents and restricted cash at beginning of year	402,565	580,893	351,911
Cash, cash equivalents and restricted cash at end of year	\$ 563,439	\$ 402,565	\$ 580,893

See the accompanying notes to consolidated financial statements

ENTEGRIS, INC. AND SUBSIDIARIES
CONSOLIDATED STATEMENTS OF CASH FLOWS (CONTINUED)

Supplemental Cash Flow Information

<i>(In thousands)</i>	Year ended December 31, 2022	Year ended December 31, 2021	Year ended December 31, 2020
Non-cash transactions:			
Equity consideration on acquisition of CMC Materials, Inc.	\$ 1,265,690	\$ —	\$ —
Deferred acquisition payments, net	—	250	1,482
Equipment purchases in accounts payable	28,295	29,042	11,921
Dividends payable	654	658	593
Schedule of interest and income taxes paid:			
Interest paid	\$ 164,183	\$ 46,791	\$ 42,575
Income taxes, net of refunds received	113,666	88,059	37,228

See the accompanying notes to consolidated financial statements

ENTEGRIS, INC.
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
DECEMBER 31, 2022

(1) SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

Nature of Operations Entegris, Inc. (“Entegris”, “the Company”, “we”, or “our”) is a leading supplier of advanced materials and process solutions for the semiconductor and other high-technology industries.

Principles of Consolidation The consolidated financial statements include the accounts of the Company and its majority-owned subsidiaries. Our recently acquired subsidiary, CMC Materials, Inc., follows a monthly reporting calendar and the Company follows a 5-4-4 week reporting calendar. CMC Materials, Inc.’s and the Company’s fourth quarter ends December 31, 2022. The Company believes that use of the different fiscal periods for this entity has not had a material impact on the Company’s consolidated financial position, results of operations, or cash flows. Intercompany profits, transactions and balances have been eliminated in consolidation.

Use of Estimates and Basis of Presentation The preparation of consolidated financial statements in conformity with accounting principles generally accepted in the United States requires management to make judgments, estimates and assumptions that affect the amounts reported in the consolidated financial statements and accompanying notes. On an ongoing basis, Entegris evaluates its estimates, including those related to receivables, inventories, property, plant and equipment, goodwill, intangible assets, accrued liabilities, income taxes and share-based compensation, among others. Actual results could differ from those estimates.

Cash and Cash Equivalents Cash and cash equivalents include cash on hand and highly liquid debt securities with original maturities of three months or less, which are valued at cost and approximate fair value.

Allowance for Credit Losses An allowance for uncollectible trade receivables is estimated based on a combination of write-off history, aging analysis and any specific, known troubled accounts. The Company maintains an allowance for credit losses that management believes is adequate to cover expected losses on trade receivables.

Inventories Inventories are stated at the lower of cost and net realizable value. Cost is determined by the first-in, first-out (FIFO) method.

Leases The Company determines if an arrangement is a lease at inception. Right-of-use (ROU) assets include operating leases. Lease liabilities for operating leases are classified in “Other accrued liabilities” and “Long-term lease liabilities” in our consolidated balance sheet. We do not have material finance leases.

Operating assets and liabilities are recognized at commencement date based on the present value of the lease payments over the lease term. As most of our leases do not provide an implicit rate, we use our incremental borrowing rate based on the information available at commencement date in determining the present value of lease payments. We use the implicit rate when readily determinable. The ROU assets include prepaid lease payments and exclude lease incentives. Lease terms may include options to extend or terminate the lease when it is reasonably certain that the Company will exercise that option. Lease expense for lease payments is recognized on a straight-line basis over the lease term.

Lease and non-lease components are generally accounted for separately for real estate leases. For non-real estate leases, we account for the lease and non-lease components as a single lease component.

Property, Plant and Equipment Property, plant and equipment are carried at cost and are depreciated using the straight-line method over the estimated useful lives of the assets. When assets are retired or disposed of, the cost and related accumulated depreciation are removed from the accounts, and gains or losses are recognized in the same period. Maintenance and repairs are expensed as incurred, while significant additions and improvements are capitalized. Long-lived assets, including property, plant and equipment, are reviewed for impairment whenever events or changes in circumstances indicate that the carrying amount of an asset or group of assets may not be recoverable based on estimated future undiscounted cash flows. The amount of impairment, if any, is measured as the difference between the net book value and the estimated fair value of the asset(s).

Fair Value of Financial Instruments The carrying value of cash equivalents, accounts receivable, accounts payable, accrued payroll and related benefits, and other accrued liabilities approximates fair value due to the short maturity of those instruments. Fair value is defined as the price that would be received from the sale of an asset or paid to transfer a liability (an exit price) in the principal or most advantageous market for the asset or liability in an orderly transaction between market participants on the measurement date. The three-level hierarchy for disclosure is based on the extent and level of judgment used to estimate fair value. Level 1 inputs consist of valuations based on quoted market prices in active markets for identical assets or liabilities. Level 2 inputs consist of valuations based on quoted prices for similar assets or liabilities, quoted prices for identical assets or liabilities in an inactive market, or other observable inputs. Level 3 inputs consist of valuations based on unobservable inputs that are supported by little or no market activity.

Goodwill and Intangible Assets Goodwill represents the excess of acquisition costs over the fair value of the net assets of businesses acquired. Goodwill is not subject to amortization, but is tested for impairment annually at August 31, the Company's annual testing date, and whenever events or changes in circumstances indicate that impairment may have occurred. The Company compares the carrying value of its reporting units, including goodwill, to their fair value. For reporting units in which the assessment indicates that it is more likely than not that the fair value is more than its carrying value, goodwill is not considered impaired. If the carrying value of the reporting unit exceeds fair value, goodwill is considered impaired.

Based on its annual analysis, the Company determined there was no indication of impairment of goodwill and the estimated fair value of each reporting unit exceeded its carrying value.

Amortizable intangible assets include, among other items, patented, unpatented and other developed technology and customer-based intangibles, and are amortized using the straight-line method over their respective estimated useful lives. The Company reviews intangible assets and other long-lived assets for impairment if changes in circumstances or the occurrence of events suggest the remaining value may not be recoverable.

Derivative Financial Instruments The Company is exposed to various market risks, including risks associated with interest rates and foreign currency exchange rates. We enter into certain derivative transactions to mitigate the volatility associated with these exposures. We have policies in place that define acceptable instrument types we may enter into and we have established controls to limit our market risk exposure. We do not use derivative financial instruments for trading or speculative purposes. In addition, all derivatives, whether designated in hedging relationships or not, are recorded on the consolidated balance sheets at fair value on a gross basis.

Interest Rate Swap

The fair value of the interest rate swap is estimated using standard valuation models using market-based observable inputs over the contractual term, including one-month Secured Overnight Financing Rate ("SOFR") based yield curves, among others. We consider the risk of nonperformance, including counterparty credit risk, in the calculation of the fair value. We have designated this swap agreement as a cash flow hedge. As a cash flow hedge, unrealized gains are recognized as assets and unrealized losses are recognized as liabilities. Unrealized gains and losses are designated as effective or ineffective based on a comparison of the changes in fair value of the interest rate swap and changes in fair value of the underlying exposures being hedged. The effective portion is recorded as a component of accumulated other comprehensive loss, while the ineffective portion is recorded as a component of Interest expense. Changes in the method by which we pay interest from one-month SOFR to another rate of interest could create ineffectiveness in the swap, and result in amounts being reclassified from other comprehensive income (loss) into net income. Hedge effectiveness is tested quarterly to determine if hedge treatment is appropriate. Realized gains and losses are recorded on the same financial statement line as the hedged item, which is Interest expense.

Foreign Currency Contracts Not Designated as Hedges

On a periodic basis, we enter into forward foreign exchange contracts in an effort to mitigate the risks associated with currency fluctuations on certain foreign currency balance sheet exposures. These foreign exchange contracts do not qualify for hedge accounting; therefore, the gains and losses resulting from the impact of currency exchange rate movements on our forward foreign exchange contracts are recognized as Other expense (income), net in the accompanying consolidated statements of operations in the period in which the exchange rates change.

Foreign Currency Translation Assets and liabilities of certain foreign subsidiaries are translated from foreign currencies into U.S. dollars at period-end exchange rates, and the resulting gains and losses arising from translation of net assets located outside the U.S. are recorded as a cumulative translation adjustment, a component of accumulated other comprehensive loss in the consolidated balance sheets. Income statement amounts are translated at the average exchange rates for the year. Translation adjustments are not adjusted for income taxes, as substantially all translation adjustments relate to permanent investments in non-U.S. subsidiaries. Gains and losses resulting from foreign currency transactions are included in Other expense (income), net, in the Company's consolidated statements of operations.

Revenue Recognition Revenue is measured based on consideration specified in a contract with a customer, and excludes any sales incentives and amounts collected on behalf of third parties. The Company recognizes revenue when it satisfies a performance obligation by transferring control over a product or service to a customer.

Taxes assessed by a governmental authority that are both imposed on and concurrent with a specific revenue-producing transaction, that are collected by the Company from a customer, are excluded from revenue.

Shipping and handling costs associated with outbound freight after control over a product has transferred to a customer are accounted for as a fulfillment cost and are included in cost of sales.

The Company recognizes the incremental costs of obtaining contracts as an expense when incurred if the amortization period of the assets that the Company otherwise would have recognized is one year or less.

When the Company receives consideration, or such consideration is unconditionally due, from a customer prior to transferring goods or services to the customer under the terms of a sales contract, the Company records deferred revenue, which represents a contract liability. Such deferred revenue typically results from advance payments received on sales of the Company's products. The Company makes the required disclosures with respect to deferred revenue in Note 2 to the consolidated financial statements.

The Company does not disclose information about remaining performance obligations that have original expected durations of one year or less.

The following is a description of principal activities from which the Company generates its revenues. The Company has four reportable segments. For more detailed information about reportable segments, see Note 20 to the consolidated financial statements. For each of the four reportable segments, the recognition of revenue regarding the nature of goods and services provided by the segments are similar and described below. The Company recognizes revenue for product sales at a point in time following the transfer of control of such products to the customer, which generally occurs upon shipment or delivery, depending on the terms of the underlying contracts. For product sales contracts that contain multiple performance obligations, the Company allocates the transaction price to each performance obligation identified in the contract based on relative standalone selling prices, or estimates of such prices, and recognizes the related revenue as control of each individual product is transferred to the customer in satisfaction of the corresponding performance obligations. All material revenue is being recognized at a point in time.

The Company generally recognizes revenue for sales of services when the Company has satisfied the performance obligation. The payment terms and revenue recognized are based on time and materials.

The Company also enters into arrangements to license its intellectual property. These arrangements typically permit the customer to use a specialized manufacturing process and in return the Company receives a royalty fee. The Company recognizes revenue for a sales-based or usage-based royalty promised in exchange for a license of intellectual property when the subsequent sale or usage occurs.

The Company offers certain customers cash discounts and volume rebates as sales incentives. The discounts and volume rebates are recorded as a reduction in sales at the time revenue is recognized in an amount estimated based on historical experience and contractual obligations. The Company periodically reviews the assumptions underlying its estimates of discounts and volume rebates and adjusts its revenues accordingly.

In addition, the Company offers free product rebates to certain customers. The Company utilizes an adjusted market approach to estimate the stand-alone selling price of the loyalty program and allocates a portion of the consideration received to the free product offering. The free product offering is redeemable upon future purchases of the Company's products. The amount associated with free product rebates is recorded as deferred revenue on the balance sheet and is recognized as revenue when the free product is redeemed or when the likelihood of redemption is remote. The Company has deemed that the amount is immaterial for disclosure.

The Company provides for the estimated costs of fulfilling its obligations under product warranties at the time the related revenue is recognized. The Company estimates the costs based on historical failure rates, projected repair costs, and knowledge of specific product failures (if any). The specific warranty terms and conditions vary depending upon the product sold and the country in which we do business, but generally include parts and labor over a period generally ranging from 90 days to one year. The Company regularly reevaluates its estimates to assess the adequacy of the recorded warranty liabilities and adjusts the amounts as necessary.

The Company's contracts are generally short-term in nature. Most contracts do not exceed twelve months. Payment terms vary by the type and location of the Company's customers and the products or services offered. The term between invoicing and when payment is due is not significant. For certain products or services and customer types, the Company requires payment before the products or services are delivered to the customer. Those customers that prepay are represented by the contract liabilities until the performance obligations are satisfied.

Engineering, Research and Development Expenses Engineering, research and development expenses are expensed as incurred.

Share-based Compensation The Company measures the cost of employee services received in exchange for the award of equity instruments based on the fair value of the award at the date of grant. Share-based compensation expense is recognized using the straight-line attribution method to recognize share-based compensation over the service period of the award, with adjustments recorded for forfeitures as they occur. Awards issued to employees who are retirement eligible or nearing retirement eligibility are expensed on an accelerated basis.

Income Taxes The Company accounts for income taxes under the asset and liability method, which requires the recognition of deferred tax assets and liabilities for the expected future tax consequences of events that have been included in the financial

statements. Under this method, deferred tax assets and liabilities are determined on the basis of the differences between the financial statements and tax basis of assets and liabilities using enacted tax rates in effect for the year in which the differences are expected to reverse. The effect of a change in tax rates on deferred tax assets and liabilities is recognized in income tax expense in the period that includes the enactment date.

The Company recognizes deferred tax assets to the extent that it believes these assets are more likely than not to be realized. A valuation allowance is recorded to reduce deferred tax assets when it is more likely than not that the Company would not be able to realize all or part of its deferred tax assets. In making such a determination, the Company considers all available positive and negative evidence, including future reversals of existing temporary differences, projected future taxable income, tax-planning strategies, and results of recent operations. If the Company determines that it would be able to realize its deferred tax assets in the future in excess of their net recorded amount, the Company would make an adjustment to the deferred tax asset valuation allowance, which would reduce the provision for income taxes.

The Company's policy for recording interest and penalties associated with audits and unrecognized tax benefits is to record such items as a component of income before taxes. Penalties and interest to be paid or received are recorded in other expense (income), net, in the statement of operations.

Comprehensive Income Comprehensive income represents the change in equity resulting from items other than shareholder investments and distributions. The Company's foreign currency translation adjustments, unrealized gains and losses on available-for-sale investments, interest rate swap - cash flow hedge and minimum pension liability adjustments are included in accumulated other comprehensive loss. Comprehensive income and the components of accumulated other comprehensive loss are presented in the accompanying consolidated statements of comprehensive income and consolidated statements of equity.

Recent Accounting Pronouncements Adopted in 2022 In October 2021, the FASB issued ASU 2021-08, Business Combinations (Topic 805), Accounting for Contract Assets and Contract Liabilities from Contracts with Customers, which requires an acquirer to recognize and measure contract assets and liabilities acquired in a business combination in accordance with Revenue from Contracts with Customers ("Topic 606") rather than adjust them to fair value at the acquisition date. The Company adopted ASU No. 2021-08 on July 3, 2022 and adopted prospectively, and there was no material effect on its consolidated financial statements.

In November 2021, the FASB issued ASU 2021-10, Government Assistance (Topic 832): Disclosures by Business Entities about Government Assistance. This update requires annual disclosures about transactions with a government that are accounted for by applying a grant or contribution accounting model by analogy. The Company adopted the ASU 2021-10 in the fourth quarter of 2022 and applied prospectively. The adoption of this standard did not have a material impact on the Company's consolidated financial statements and related disclosures.

Recent Accounting Pronouncements Yet to be Adopted

The Company currently has no material recent accounting pronouncements yet to be adopted.

(2) REVENUES

The following table provides information about current contract liabilities from contracts with customers. The contract liabilities are included in other accrued liabilities balance in the consolidated balance sheet.

<i>(In thousands)</i>	2022	2021
Balance at beginning of year	\$ 23,050	\$ 13,852
Additions due to acquisition	11,108	—
Revenue recognized that was included in the contract liability balance at the beginning of the period	(30,667)	(13,819)
Increases due to cash received, excluding amounts recognized as revenue during the period	57,490	23,017
Contract liabilities included in asset held-for-sale	(505)	—
Balance at end of year	<u>\$ 60,476</u>	<u>\$ 23,050</u>

(3) ACQUISITIONS

CMC Materials, Inc.

On July 6, 2022 (the "Closing Date"), the Company completed its acquisition of CMC Materials, Inc. ("CMC Materials"), a Delaware corporation, for approximately \$6.0 billion in cash and stock (the "Merger") pursuant to an Agreement and Plan of Merger dated as of December 14, 2021 (the "Merger Agreement"). As a result of the Merger, CMC Materials became a wholly owned subsidiary of the Company. The Merger was accounted for under the acquisition method of accounting and the results of

operations of CMC Materials are included in the Company's consolidated financial statements as of and since July 6, 2022. CMC Materials reports into the Advanced Planarization Solutions and Specialty Chemicals and Engineered Materials segments of the Company. Direct costs of \$39.5 million associated with the acquisition of CMC Materials, consisting primarily of professional and consulting fees, were expensed as incurred in the twelve months ended December 31, 2022, respectively. These costs are classified as selling, general and administrative expense in the Company's consolidated statement of operations. The amounts of net sales and net loss from CMC Materials since the acquisition date included in the consolidated statement of operations for the twelve months ended December 31, 2022 are \$581.0 million and \$75.8 million, respectively.

CMC Materials is a global supplier of consumable materials, primarily to semiconductor manufacturers. The Company's products play a critical role in the production of advanced semiconductor devices, helping to enable the manufacture of smaller, faster and more complex devices by its customers. The acquisition was executed to expand the Company's product offering base and technological base, enhance the Company's materials and process solutions for the most advanced manufacturing environments and help customers improve productivity, performance and total cost of ownership.

The purchase price of CMC Materials consisted of the following:

(In thousands)

Cash paid to CMC Materials' shareholders	\$	3,836,983
Stock paid to CMC Materials' shareholders		1,265,690
Repayment of CMC Materials' indebtedness		918,578
Total purchase price		6,021,251
Less cash and cash equivalents acquired		280,636
Total purchase price, net of cash acquired	\$	5,740,615

Under the terms of the Merger Agreement, the Company paid \$133.00 per share for all outstanding shares of CMC Materials (excluding treasury shares). In addition, the Company settled all outstanding share-based compensation awards held by CMC Materials' employees at the same per share price except for certain unvested performance units that were replaced by the Company's restricted share units. The acquisition method of accounting requires the Company to include the amount associated with pre-combination service as purchase price for the acquisition, reflected in the table immediately above.

The Merger was funded with existing cash balances as well as funds raised by the Company through the issuance of debt in the form of a new term loan facility in the aggregate principal amount of \$2,495.0 million, senior secured notes due 2029 in an aggregate principal amount of \$1,600.0 million, senior unsecured notes due 2030 in an aggregate principal amount of \$895.0 million, and a 364-Day Bridge Credit Facility in the aggregate principal amount of \$275.0 million (collectively "CMC Materials Acquisition Financing"). For additional information, see Note 10 to the Company's consolidated financial statements.

The following table summarizes the allocation of the purchase price to the fair values assigned to the assets acquired and liabilities assumed at the date of the Merger as originally reported and as of December 31, 2022:

(In thousands)

	As of July 6, 2022	As of December 31, 2022
Cash and cash equivalents	\$ 280,636	\$ 280,636
Accounts receivable and other current assets	206,887	205,395
Inventory	256,598	256,598
Property, plant and equipment	534,363	537,386
Identifiable intangible assets	1,727,119	1,729,019
Other noncurrent assets	44,149	39,741
Current liabilities	(213,089)	(211,046)
Deferred tax liabilities and other noncurrent liabilities	(448,550)	(444,935)
Net assets acquired	2,388,113	2,392,794
Goodwill	3,633,138	3,628,457
Total purchase price	\$ 6,021,251	\$ 6,021,251

The fair value of acquired inventories was \$256.6 million and is valued at the estimated selling price less the cost of disposal and reasonable profit for the selling effort. The fair value write-up of acquired finished goods inventory was \$61.9 million. This

amount was recorded as an incremental cost of sales charge, amortized over the expected turn of the acquired inventory, during the year ended December 31, 2022.

The fair value of acquired property, plant and equipment of \$537.4 million is valued at its fair value assuming held and used, unless market data was available supporting the fair value.

The Company recognized the following provisional intangible assets as part of the acquisition of CMC Materials and finite lived assets will be amortized on a straight-line basis:

<i>(In thousands)</i>	Amount	Weighted average life in years
Developed technology	\$ 1,035,600	7.3
Trademarks and trade names	236,600	14.9
Customer relationships	414,800	18.7
In-process research and development ⁽¹⁾	31,100	
Other	10,919	1.2
	<u>\$ 1,729,019</u>	11.1

(1) In-process research and development assets are treated as indefinite-lived until the completion or abandonment of the associated research and development project, at which time the appropriate useful lives would be determined.

The fair value of acquired identifiable finite intangible assets was determined using an income method, which utilizes discounted cash flows to fair value each of the identifiable intangible assets. The Company normally utilizes the “income method,” which starts with a forecast of all of the expected future net cash flows attributable to the subject intangible asset. These cash flows are then adjusted to present value by applying an appropriate discount rate that reflects the risk factors associated with the cash flow streams. Depending on the asset valued, the key assumptions included one or more of the following: (1) future revenue growth rates, (2) future gross margin, (3) future selling, general and administrative expenses, (4) royalty rates, and (5) discount rates. The valuations were based on the information that was available as of the acquisition date and the expectations and assumptions that have been deemed reasonable by the Company’s management. There are inherent uncertainties and management judgment required in these determinations. The fair value measurements of the assets acquired and liabilities assumed were based on valuations involving significant unobservable inputs, or Level 3 in the fair value hierarchy.

The purchase price of CMC Materials exceeded the fair value of the net of the acquisition-date amounts of the identifiable assets acquired and the liabilities assumed by \$3,628.5 million. Cash flows used to determine the purchase price included strategic and synergistic benefits (investment value) specific to the Company, which resulted in a purchase price in excess of the fair value of identifiable net assets. The purchase price also included the fair values of other assets that were not identifiable, not separately recognizable under accounting rules (e.g., assembled workforce) or of immaterial value in addition to a going-concern element that represents the Company’s ability to earn a higher rate of return on the group of assets than would be expected on the separate assets as determined during the valuation process. This additional investment value resulted in goodwill. No amount of goodwill is expected to be deductible for tax purposes. The assignment of goodwill to the Company’s reportable segments will be finalized in connection with the final valuation of assets acquired and liabilities assumed.

The final valuation of assets acquired and liabilities assumed is expected to be completed as soon as possible, but no later than one year from the acquisition date. Given the size and complexity of the acquisition, the valuation of certain assets and liabilities is still being finalized. In addition to identifiable intangible assets, for the reasons noted above, the Company’s valuation of the CMC Materials’ tax accounts is provisional pending the completion of and the Company’s review of CMC Materials’ tax returns to be filed for periods up to the acquisition date. To the extent that the Company’s estimates require adjustment, the Company will modify the value.

Pro Forma Results (Unaudited)

The following unaudited pro forma financial information presents the combined results of operations of the Company as if the acquisition of CMC Materials had occurred as of the beginning of the years presented. The unaudited pro forma financial information is not necessarily indicative of what the Company’s consolidated results of operations would have been had the acquisition occurred at the beginning of each year. In addition, the unaudited pro forma financial information does not attempt

to project the future results of operations of the combined company. The pro forma information does not include any potential revenue enhancements, cost synergies or other operating efficiencies that could result from the acquisition.

<i>(In thousands)</i>	Year Ended	
	December 31, 2022	December 31, 2021
Net sales	\$ 3,920,850	\$ 3,518,893
Net income (loss)	308,741	(161,756)
Per share amounts:		
Net income (loss) per common share - basic	\$ 2.08	\$ (1.09)
Net income (loss) per common share - diluted	\$ 2.05	\$ (1.09)

The unaudited pro forma financial information above gives effect to the following:

- The elimination of transactions between Entegris and CMC Materials, which upon completion of the Merger would be considered intercompany. This reflects the elimination of intercompany sales and associated intercompany accounts.
- Incremental amortization and depreciation expense related to the estimated fair value of identifiable intangible assets and property, plant and equipment from the purchase price allocation.
- Interest expense on the new debt raised to fund in part the consideration paid to effect the Merger using the effective interest rates.
- The elimination of interest expense, net of the gain on the termination of two swap instruments which were terminated on June 24, 2022 associated with the extinguished CMC Materials' debt outstanding.
- The elimination of interest expense associated with the repayment of the \$145.0 million senior secured term loan facility due 2025.
- The amortization of deferred financing costs and original issue discount associated with the aggregate new debt facilities.
- Transaction and integration costs directly attributable to the Merger were reclassified as of the beginning of the comparable prior annual reporting period.
- The incremental pro forma stock-based compensation expense for accelerated vesting upon the change in control for stock options, restricted stock units, restricted stock shares, phantom units, and other deferred restricted stock units.
- The additional cost of goods sold recognized in connection with the write-up of acquired finished goods inventory of \$61.9 million. The write-up is recognized in cost of sales as the inventory is sold, which for purposes of these pro forma financial statements is assumed to occur within the first quarter after the Merger.
- The income tax effect of the transaction accounting adjustments related to the Merger calculated using a blended statutory income tax rate of 22.5%.

Precision Microchemicals

On November 30, 2021, the Company completed its acquisition of the Precision Microchemicals business from BASF SE. The Precision Microchemicals business reports into the Specialty Chemicals and Engineered Materials segment of the Company. The acquisition was accounted for under the acquisition method of accounting, and the Precision Microchemicals business results of operations are included in the Company's consolidated financial statements as of and since November 30, 2021. Costs associated with the acquisition of the Precision Microchemicals business were \$0.2 million for the year ended December 31, 2021 and were expensed as incurred. These costs are included in the selling, general and administrative expenses in the Company's consolidated statement of operations. The acquisition does not constitute a material business combination.

The purchase price for the Precision Microchemical business includes cash consideration of \$89.7 million (net of cash acquired), which was funded from the Company's existing cash on hand.

The purchase price of the Precision Microchemical business exceeds the net of the acquisition-date amounts of the identifiable assets acquired and the liabilities assumed by \$42.8 million. Cash flows used to determine the purchase price included strategic and synergistic benefits (investment value) specific to the Company, which resulted in a purchase price in excess of the fair value of identifiable net assets. This additional investment value resulted in goodwill, which is expected to be deductible for income tax purposes.

The fair value of acquired identifiable intangible assets was determined using Level 3 inputs for the "income approach" on an individual asset basis. The key assumptions used in the calculation of the discounted cash flows include future revenue growth rates, future gross margin, future selling, general and administrative expense, royalty rates, and discount rates. The valuations

and the underlying assumptions have been deemed reasonable by the Company's management. There are inherent uncertainties and management judgment required in these determinations.

During the quarter ended April 2, 2022, the Company finalized its fair value determination of the assets acquired and the liabilities assumed. The following table summarizes the final allocation of the purchase price to the fair values assigned to the assets acquired and liabilities assumed at the date of the acquisition:

<i>(In thousands)</i>	November 30, 2021	As of April 2, 2022
Inventories, net	\$ 967	\$ 967
Other current assets	19	19
Identifiable intangible assets	44,910	44,910
Right-of-use assets	1,912	1,912
Property, plant and equipment	1,002	1,002
Other noncurrent assets	18	18
Accounts payable and accrued liabilities	(43)	(30)
Short-term lease liability	(170)	(170)
Long-term lease liability	(1,742)	(1,742)
Net assets acquired	46,873	46,886
Goodwill	42,819	42,824
Total purchase price, net of cash acquired	\$ 89,692	\$ 89,710

The Company recognized the following provisional finite-lived intangible assets as part of the acquisition of the Precision Microchemical business:

<i>(In thousands)</i>	Amount	Weighted average life in years
Developed technology	\$ 9,600	9.0
Trademarks and trade names	3,400	15.0
Customer relationships	31,800	15.5
Other	110	
	\$ 44,910	14.1

(4) ASSET HELD-FOR-SALE

On October 11, 2022, the Company entered into a definitive agreement with Infineum USA L.P. for the sale of its Pipeline and Industrials Materials ("PIM") business, which became part of the Company with the recent acquisition of CMC Materials. PIM reports into the Specialty Chemicals and Engineered Materials segment of the Company. Effective February 10, 2023, the Company terminated the definitive agreement in accordance with its terms. At the time of the termination, the transaction had not received clearance under the Hart-Scott-Rodino Act..

During the fourth quarter of 2022, the related assets and liabilities were classified as held-for-sale in the Company's consolidated balance sheet and measured at the lower of their carrying amount or fair value less cost to sell. PIM's income before income taxes attributable to the PIM business was \$4.8 million for the year ended December 31, 2022. Due to management's decision to terminate the agreement in first quarter of 2023, the Company will monitor and evaluate the held-for-sale criteria at the end of the first quarter 2023.

The planned disposition of PIM did not meet the criteria to be classified as a discontinued operation in the Company's financial statements since the disposition did not represent a strategic shift that had, or will have, a major effect on the Company's operations and financial results.

Assets-held-for sale comprise the following as of December 31, 2022:

(In thousands)

	December 31, 2022	
Assets:		
Accounts Receivable	\$	16,103
Inventory		29,331
Other current assets		633
Property, Plant and Equipment, net		108,036
Intangible assets, net		76,319
Goodwill		8,822
Other assets		7,287
Total assets-held-for sale	\$	246,531
Liabilities:		
Accounts payable	\$	4,185
Accrued expenses		5,029
Long-term liabilities		1,423
Total liabilities-held-for sale	\$	10,637

(5) RESTRICTED CASH

The following table provides a reconciliation of cash, cash equivalents and restricted cash reported within the consolidated balance sheet that sum to the total of the same amounts shown in the consolidated statement of cash flows.

(In thousands)

	December 31, 2022	December 31, 2021
Cash and cash equivalents	\$ 561,559	\$ 402,565
Restricted cash	1,880	—
Total cash, cash equivalents and restricted cash	\$ 563,439	\$ 402,565

The restricted cash represents cash held in a “Rabbi” trust. Prior to the acquisition of CMC Materials, CMC Materials’ change in control severance protection agreements required CMC Materials to establish a Rabbi trust prior to a change in control and fully fund the trust to cover all the severance benefits that may become payable under the agreements.

(6) TRADE ACCOUNTS AND NOTES RECEIVABLE

Trade accounts and notes receivable from customers at December 31, 2022 and 2021 consist of the following:

(In thousands)

	2022	2021
Accounts receivable	\$ 536,256	\$ 347,111
Notes receivable	4,672	2,651
Total trade accounts and notes receivable	540,928	349,762
Less allowance for credit losses	5,443	2,349
Trade accounts and notes receivable, net	\$ 535,485	\$ 347,413

(7) INVENTORIES

Inventories at December 31, 2022 and 2021 consist of the following:

(In thousands)

	2022	2021
Raw materials	\$ 337,576	\$ 191,986
Work-in-process	60,182	40,257
Finished goods ^(a)	415,057	242,970
Inventories, net	\$ 812,815	\$ 475,213

^(a) Includes consignment inventories held by customers of \$46.2 million and \$16.0 million at December 31, 2022 and 2021, respectively.

(8) PROPERTY, PLANT AND EQUIPMENT

Property, plant and equipment at December 31, 2022 and 2021 consists of the following:

<i>(In thousands)</i>	2022	2021	Estimated useful lives in years
Land	\$ 62,192	\$ 24,000	
Buildings and improvements	490,903	281,019	5-35
Manufacturing equipment	569,224	415,985	5-10
Canisters and cylinders	168,516	142,071	3-12
Molds	76,388	77,708	3-5
Office furniture and lab equipment	330,284	189,258	3-8
Construction in progress	465,923	177,161	
Total property, plant and equipment	2,163,430	1,307,202	
Less accumulated depreciation	770,093	653,104	
Property, plant and equipment, net	<u>\$ 1,393,337</u>	<u>\$ 654,098</u>	

The table below sets forth the depreciation expense for the years ended December 31, 2022, 2021 and 2020:

<i>(In thousands)</i>	2022	2021	2020
Depreciation expense	\$ 135,371	\$ 90,311	\$ 83,430

(9) GOODWILL AND INTANGIBLE ASSETS

Goodwill activity for each of the Company's reportable segments that carry goodwill, Specialty Chemicals and Engineered Materials ("SCEM"), Microcontamination Control ("MC"), Advanced Materials Handling ("AMH"), and Advanced Planarization Solutions ("APS") for the years ended December 31, 2022 and 2021 is shown below:

<i>(In thousands)</i>	SCEM	MC	AMH	APS	Total
December 31, 2020	\$ 427,713	\$ 247,154	\$ 73,170	\$ —	\$ 748,037
Addition due to acquisitions	42,819	—	932	—	43,751
Purchase accounting adjustments	—	—	—	—	—
Foreign currency translation	343	1,571	—	—	1,914
December 31, 2021	470,875	248,725	74,102	—	793,702
Addition due to acquisition	210,122	—	—	3,418,335	3,628,457
Purchase accounting adjustments	5	—	—	—	5
Goodwill reallocation	(110,798)	—	—	110,798	—
Goodwill included in assets held-for-sale	(8,822)	—	—	—	(8,822)
Foreign currency translation	(54)	(6,637)	—	1,680	(5,011)
December 31, 2022	<u>\$ 561,328</u>	<u>\$ 242,088</u>	<u>\$ 74,102</u>	<u>\$ 3,530,813</u>	<u>\$ 4,408,331</u>

As of December 31, 2022, goodwill amounted to approximately \$4,408.3 million, an increase of \$3,614.6 million from the balance at December 31, 2021. The increase in goodwill in 2022 reflects the acquisition of CMC Materials as described in Note 3, foreign currency translation, goodwill reclassified to asset held-for-sale as described in Note 4 and goodwill reallocation. The goodwill reallocation related to the creation of our new APS segment during the third quarter of 2022, which included a transfer of some related operations in our SCEM reportable segment to our APS reportable segment. We have allocated goodwill to our reporting units using a relative fair value approach. In addition, we completed an assessment of any potential goodwill impairment for all reporting units immediately prior and subsequent to the reallocation and determined that no impairment existed. There were no goodwill impairments for any of the years presented.

The increase in goodwill in 2021 reflects the acquisition of the Precision Microchemicals business described in Note 3, other immaterial acquisition and foreign currency translation.

Identifiable intangible assets at December 31, 2022 and 2021 consist of the following:

2022				
<i>(In thousands)</i>	Gross carrying amount	Accumulated amortization	Net carrying value	Weighted average life in years
Developed technology	\$ 1,302,101	\$ 313,876	\$ 988,225	7.3
Trademarks and trade names	250,473	29,565	220,908	14.3
Customer relationships	863,947	273,039	590,908	15.4
In-process research and development ⁽¹⁾	31,100	—	31,100	
Other	31,206	20,392	10,814	4.3
	<u>\$ 2,478,827</u>	<u>\$ 636,872</u>	<u>\$ 1,841,955</u>	10.8

⁽¹⁾ Intangible assets acquired in a business combination that are in-process and used in research and development activities are considered indefinite-lived until the completion or abandonment of the research and development efforts. Once the research and development efforts are completed, we determine the useful life and begin amortizing the assets.

2021				
<i>(In thousands)</i>	Gross carrying amount	Accumulated amortization	Net carrying value	Weighted average life in years
Developed technology	\$ 293,982	\$ 232,722	\$ 61,260	7.2
Trademarks and trade names	33,553	20,340	13,213	10.6
Customer relationships	481,674	227,350	254,324	12.4
Other	20,505	14,189	6,316	6.6
	<u>\$ 829,714</u>	<u>\$ 494,601</u>	<u>\$ 335,113</u>	10.3

The table below sets forth the amortization expense for finite-lived intangible assets for the years ended December 31, 2022, 2021, and 2020:

<i>(In thousands)</i>	2022	2021	2020
Amortization expense	\$ 143,953	\$ 47,856	\$ 53,092

The amortization expense for each of the five succeeding years and thereafter relating to finite-lived intangible assets currently recorded in the Company's consolidated balance sheets is estimated to be the following at December 31, 2022:

<i>(In thousands)</i>	2023	2024	2025	2026	2027	Thereafter	Total
Future amortization expense	\$ 230,469	211,437	204,917	203,373	199,859	791,900	\$ 1,841,955

(10) DEBT

The Company's debt at December 31, 2022 and 2021 consists of the following:

<i>(In thousands)</i>	2022	2021
Senior secured term loan facility due 2029	\$ 2,495,000	\$ —
Senior secured notes due 2029	1,600,000	—
Senior unsecured notes due 2030	895,000	—
Senior unsecured notes due 2029	400,000	400,000
Senior unsecured notes due 2028	400,000	400,000
Bridge Credit Facility due 2023	135,000	—
Senior secured term loan facility due 2025	—	145,000
	<u>\$ 5,925,000</u>	<u>\$ 945,000</u>
Unamortized discount and debt issuance costs	140,107	7,973
Total debt, net	<u>\$ 5,784,893</u>	<u>\$ 937,027</u>
Less short-term debt, including current portion of long-term debt	151,965	—
Total long-term debt, net	<u>\$ 5,632,928</u>	<u>\$ 937,027</u>

Annual maturities of long-term debt, excluding unamortized discount and issuance costs, due as of December 31, 2022 are as follows:

<i>(In thousands)</i>	2023	2024	2025	2026	2027	Thereafter	Total
Contractual debt obligation maturities*	\$ 153,713	24,950	24,950	24,950	24,950	5,671,487	\$ 5,925,000

*Subject to excess cash flow payments to the lenders, see discussion below.

CMC Materials Acquisition Financing

On the Closing Date, the Company completed its acquisition of CMC Materials pursuant to the Merger Agreement, by and among the Company, CMC Materials and Yosemite Merger Sub, Inc., a Delaware corporation and wholly owned subsidiary of the Company (“Merger Sub”). Pursuant to the Merger Agreement, Merger Sub merged with and into CMC Materials, with CMC Materials surviving the Merger and becoming a wholly-owned subsidiary of the Company.

On the Closing Date, the Company and certain of its subsidiaries entered into an Amendment and Restatement Agreement (the “Amendment”), which amended and restated the Credit and Guaranty Agreement, dated as of November 6, 2018 (as previously amended, restated, amended and restated, supplemented, modified and otherwise in effect prior to the effectiveness of the Amendment, the “Existing Credit Agreement” and, the Existing Credit Agreement as amended by the Amendment, the “Amended Credit Agreement”), by and among the Company, as borrower, certain subsidiaries of the Company party thereto, as guarantors, the lenders party thereto and Morgan Stanley Senior Funding, Inc., as administrative agent and collateral agent.

The Amended Credit Agreement provides for senior secured credit facilities in an aggregate principal amount equal to \$3.1 billion, consisting of (a) a senior secured term loan credit facility in an aggregate principal amount equal to \$2.495 billion (the “Initial Term Loan Facility”) and (b) a senior secured revolving credit facility in an aggregate amount equal to \$575.0 million (the “Revolving Facility” and, together with the Initial Term Loan Facility, the “Credit Facilities”). The Revolving Facility contains sublimits for swingline loans and the issuances of letters of credit. The Company used a portion of the proceeds of the offering to repay the remaining principal amount of the \$145.0 million senior secured term loan facility due 2025. In connection with the repayment of this debt, the Company incurred a pre-tax loss on extinguishment of debt of \$0.9 million, which is included in Other expense (income), net on the consolidated statement of operations.

The commitments under the Revolving Facility expire on July 6, 2027, and any loans then outstanding will be payable in full at that time. All outstanding loans under Initial Term Loan Facility are due and payable on July 6, 2029.

The obligations under the Credit Facilities are guaranteed by certain of the Company’s wholly-owned domestic restricted subsidiaries (collectively, the “Subsidiary Guarantors”), subject to customary exceptions and limitations. The obligations under the Credit Facility are secured by a first-priority lien on substantially all of the assets of the Company and the Subsidiary Guarantors, subject to customary exceptions and limitations, on a pari passu basis with the obligations under the Secured Notes, pursuant to customary intercreditor arrangements.

Borrowings under the Initial Term Loan Facility bear interest at a rate per annum equal to, at the Company’s option, either (i) Term Secured Overnight Financing Rate (“Term SOFR”) plus an applicable margin of 3.00% or (ii) a base rate plus an applicable margin of 2.00%. Borrowings under the Revolving Facility bear interest at a rate per annum equal to, at the Company’s option, either (i) Term SOFR, in the case of US dollar denominated borrowings, or the applicable benchmark rate as further described in the Amended Credit Agreement, in the case of any other currency, in each case, plus an applicable margin of 1.75% or (ii) a base rate, plus an applicable margin of 0.75%. The applicable margin set forth in the Amended Credit Agreement steps-down depending on the First Lien Net Leverage Ratio. The Amended Credit Agreement also contains customary unused commitment fees, letter of credit fees and agency fees. The interest rate of the Term Loan Facility is 7.5% as of December 31, 2022.

The Amended Credit Agreement contains customary representations, warranties and affirmative covenants. The Amended Credit Agreement also includes negative covenants that limit, among other things, incurring additional indebtedness, transactions with affiliates, additional liens, sales of assets, dividends, investments and advances, prepayments of debt and mergers and acquisitions, in each case, subject to certain exceptions, qualifications and baskets. The Amended Credit Agreement also includes a “springing” financial covenant that would require the Company to maintain a First Lien Net Leverage Ratio of 5.20:1.00 or less as of the end of any period of four fiscal quarters ending after December 31, 2022 if at any time the Company has revolving borrowings, unreimbursed letter of credit drawings and undrawn letters of credit (subject to certain exceptions) outstanding in an amount in excess of 35.0% of the aggregate commitments in respect of the Revolving Facility.

The Amended Credit Agreement contains customary events of default for facilities of this type. If an event of default occurs and is continuing, the Company may be required immediately to repay all amounts outstanding under the Amended Credit Agreement.

On the Closing Date, the Company and the Subsidiary Guarantors entered into a 364-Day Bridge Credit and Guaranty Agreement (the “Bridge Credit Agreement”), among the Company, as borrower, certain subsidiaries of the Company party thereto, as guarantors, the lenders party thereto and Morgan Stanley Senior Funding, Inc., as administrative agent. The Bridge Credit Agreement provides for a senior unsecured term loan facility in an aggregate principal amount equal to \$275.0 million (the “Bridge Credit Facility”). All outstanding loans under the Bridge Credit Facility are due and payable on the date that is 364 days after the Closing Date. During the year, the Company made \$140.0 million of principal repayments on the Bridge Credit Facility. The Company incurred debt issuance costs of \$6.9 million in connection with the Bridge Credit Facility. In connection with the repayment of this debt, the Company incurred a loss on extinguishment of debt of \$2.1 million which is included in Other expense (income), net on the consolidated statement of operations.

Borrowings under the Bridge Credit Facility bear interest at a rate per annum equal to, at the Company’s option, either (i) Term SOFR plus an applicable margin of 4.55% or (ii) a base rate plus an applicable margin of 3.55%. In addition to paying interest on the outstanding principal under the Bridge Credit Facility, the Company will pay to each lender under the Bridge Credit Agreement duration fees equal to 0.25% of the aggregate outstanding principal amount of such lender’s loans under the Bridge Credit Facility at 90, 180 and 270 days after the Closing Date. The interest rate of the Bridge Credit Facility is 8.9% as of December 31, 2022.

The Company’s obligations under the Bridge Credit Facility are guaranteed, on an unsecured basis, by the Subsidiary Guarantors, subject to customary exceptions and limitations. The Bridge Credit Agreement contains customary representations, warranties and affirmative covenants. The Bridge Credit Agreement also includes negative covenants that limit, among other things, additional subsidiary indebtedness, additional liens, sales of assets and mergers and acquisitions, in each case, subject to certain exceptions, qualifications and baskets.

The Bridge Credit Agreement contains customary events of default, including, but not limited to, payment defaults, breaches of representations and warranties, covenant defaults, events of bankruptcy and insolvency, and a change of control. If an event of default occurs and is continuing, the Company may be required immediately to repay all amounts outstanding under the Bridge Credit Agreement.

The Company began incurring ticking fees associated with the Initial Term Loan Facility on March 2, 2022 through the Closing Date. The ticking fees were paid in cash to the term loan lenders on the Closing Date. For the twelve months ended December 31, 2022, the Company incurred \$12.0 million in ticking fees, which were recorded to interest expense, net in the consolidated statement of operations.

Senior Secured Notes Due 2029 and Senior Unsecured Notes Due 2030

On April 14, 2022, the Company, via a wholly-owned escrow subsidiary (the “Escrow Issuer”), issued \$1.6 billion aggregate principal amount of 4.750% senior secured notes due April 15, 2029 (the “2029 Notes”) pursuant to an indenture dated as of April 14, 2022 (the “2029 Notes Indenture”), by and between the Escrow Issuer and Truist Bank (“Truist”), as trustee and as notes collateral agent. Interest on the 2029 Notes is payable semi-annually in arrears on April 15 and October 15 of each year, commencing on October 15, 2022. The Company incurred debt issuance costs of \$28.5 million in connection with the 2029 Notes. These costs are reported in the Company’s consolidated balance sheet as a direct deduction from the face amount of the 2029 Notes, along with \$7.6 million of original issue discount costs.

On June 30, 2022, the Company, via the Escrow Issuer, issued \$895.0 million aggregate principal amount of 5.950% senior unsecured notes due June 15, 2030 (the “2030 Notes” and together with the 2029 Notes, the “New Notes”) pursuant to an indenture, dated as of June 30, 2022 (the “2030 Notes Indenture” and together with the 2029 Notes Indenture, the “New Notes Indentures”), by and between the Escrow Issuer and Truist. Interest on the 2030 Notes is payable semi-annually in arrears on June 15 and December 15 of each year, commencing on June 15, 2022. The Company incurred debt issuance costs of \$24.1 million in connection with the 2030 Notes. These costs are reported in the Company’s consolidated balance sheet as a direct deduction from the face amount of the 2030 Notes along with \$16.7 million of net original issue discount costs.

On the Closing Date, the Escrow Issuer merged with and into the Company and, in connection therewith, the Company executed a supplemental indenture to each New Notes Indenture and such Company subsidiaries agreed to guarantee the Company’s obligations under the New Notes.

Accordingly, each series of New Notes is guaranteed, jointly and severally, fully and unconditionally, on a senior basis, by the Company’s existing and future domestic subsidiaries, other than certain excluded subsidiaries, to the extent that such subsidiaries guarantee indebtedness under the Amended Credit Agreement or existing senior notes. In addition, the 2029 Notes and related guarantees are secured, subject to permitted liens and certain other exceptions, by first priority liens on substantially the same collateral that secures the obligations under the Amended Credit Agreement.

The Company may, at its option, redeem, at any time and from time to time prior to June 15, 2025, some or all of the 2029 Notes at 100% of the principal amount thereof plus the applicable “make-whole” premium as set forth in the 2029 Notes Indenture plus accrued and unpaid interest, if any, to, but excluding, the redemption date. On or after June 15, 2025, the

Company may redeem some or all of the 2029 Notes at the applicable prices set forth in the 2029 Notes Indenture plus accrued and unpaid interest, if any, to, but excluding, the redemption date. In addition, the Company may redeem up to 40% of the principal amount of the 2029 Notes before June 15, 2025 with the net proceeds from one or more equity offerings at the applicable price set forth in the 2029 Notes Indenture, plus accrued and unpaid interest, if any, to, but excluding, the redemption date.

The Company may, at its option, redeem, at any time and from time to time prior to January 15, 2029 (the “Par Call Date”), some or all of the 2029 Notes at 100% of the principal amount thereof plus accrued and unpaid interest, if any, to the redemption date plus the applicable “make-whole premium” described in the 2029 Notes Indenture. On or after the Par Call Date, the 2029 Notes will be redeemable, at the Company’s option, in whole or in part, at a redemption price equal to 100% of the principal amount of the 2029 Notes to be redeemed plus accrued and unpaid interest, if any, to, but excluding, the redemption date.

Upon the occurrence of certain change of control events accompanied by certain ratings events, the Company will be required to offer to repurchase all of the outstanding principal amount of each series of New Notes at a purchase price of 101% of the principal amount thereof, plus accrued and unpaid interest, if any, to, but not including, the date of repurchase.

Each New Notes Indenture contains covenants that, among other things, limit the Company’s ability and/or the ability of the Company’s subsidiaries to: incur liens; engage in sales-and-leaseback transactions; and consolidate, merge with or convey, transfer or lease all or substantially all of the Company’s and its subsidiaries’ assets to another person and limits the ability of any non-guarantor subsidiary of the Company to incur indebtedness. These covenants are subject to a number of other limitations and exceptions as set forth in the New Notes Indentures. The Company was in compliance with these covenants at December 31, 2022.

Each New Notes Indenture provides for customary events of default (subject in certain cases to customary grace and cure periods) which, if certain of them occur, would permit the trustee or the holders of at least 25% in aggregate principal amount of the then-outstanding applicable series of New Notes to declare the principal of, and interest or premium, if any, and any other monetary obligations on, all the then-outstanding series of New Notes to be due and payable immediately.

11. FAIR VALUE OF FINANCIAL INSTRUMENTS

The Company is required to record certain assets and liabilities at fair value. The valuation methods used for determining the fair value of these financial instruments by hierarchy are as follows:

Level 1 Cash and cash equivalents consist of various bank accounts used to support our operations and investments in institutional money-market funds that are traded in active markets. The restricted cash represents cash held in a “Rabbi” trust, further described in Note 5.

Level 2 Derivative financial instruments include an interest rate swap contract and foreign exchange contracts. The fair value of our derivative instruments is estimated using standard valuation models and market-based observable inputs over the contractual term, including the prevailing SOFR based yield curves for the interest rate swap, and forward rates and/or the Overnight Index Swap curve for forward foreign exchange contracts, among others. The fair value of our debt is estimated based on independent broker/dealer bids or by comparison to other debt securities having similar durations, yields and credit ratings.

Level 3 No Level 3 financial instruments

The following table presents financial instruments that we measure at fair value on a recurring basis:

(In thousands)	Fair Value Measurements at Reporting Date Using							
	Level 1		Level 2		Level 3		Total	
Assets:	2022	2021	2022	2021	2022	2021	2022	2021
Cash and cash equivalents	\$ 561,559	\$ 402,565	\$ —	\$ —	\$ —	\$ —	\$ 561,559	\$ 402,565
Restricted cash	1,880	—	—	—	—	—	1,880	—
Derivative financial instruments - Interest rate swap - cash flow hedge	—	—	46,589	—	—	—	46,589	—
Derivative financial instruments - Forward exchange contracts	—	—	726	—	—	—	726	—
Total Assets	\$ 563,439	\$ 402,565	\$ 47,315	\$ —	\$ —	\$ —	\$ 610,754	\$ 402,565
Liabilities:								
Derivative financial instruments - Forward exchange contracts	\$ —	\$ —	\$ 193	\$ —	\$ —	\$ —	\$ 193	\$ —
Total Liabilities	\$ —	\$ —	\$ 193	\$ —	\$ —	\$ —	\$ 193	\$ —

Other Fair Value Disclosures

The estimated fair value and carrying value of our debt as of December 31, 2022 and 2021 were as follows:

(In thousands)	December 31, 2022		December 31, 2021	
	Carrying Value	Fair Value	Carrying Value	Fair Value
Total debt, net	\$ 5,784,893	\$ 5,428,900	\$ 937,027	\$ 952,500

12. DERIVATIVE INSTRUMENTS

The Company is exposed to various market risks, including risks associated with interest rates and foreign currency exchange rates. One objective of the Company's risk management program is to mitigate these risks using derivative instruments.

Cash Flow Hedges - Interest Rate Swap Contract

In July 2022, the Company entered into a floating-to-fixed swap agreement on its variable rate debt under the Term Loan Facility. For further information on the Term Loan Facility, see Note 10 Debt. The interest rate swap was designated specifically to the Term Loan Facility, is highly effective and qualifies as a cash flow hedge. The notional amount is scheduled to decrease quarterly and will expire on December 30, 2025.

Foreign Currency Contracts Not Designated as Hedges

The Company enters into foreign exchange contracts in an effort to mitigate the risks associated with currency fluctuations on certain foreign currency balance sheet exposures. These foreign exchange contracts do not qualify for hedge accounting.

The notional amounts of our derivative instruments are as follows:

(In thousands)	December 31, 2022	December 31, 2021
Derivatives designated as hedging instruments:		
Interest rate swap contract - Cash flow hedge	\$ 1,950,000	\$ —
Derivatives not designated as hedging instruments:		
Foreign exchange contracts to purchase U.S. dollars	\$ 3,995	\$ —
Foreign exchange contracts to sell U.S. dollars	26,255	—

The fair values of our derivative instruments included in the consolidated balance sheets are as follows:

(In thousands)

Consolidated Balance Sheet Location	Derivative Assets		Derivative Liabilities	
	December 31, 2022	December 31, 2021	December 31, 2022	December 31, 2021
Derivatives designated as hedging instruments - Interest rate swap contract -cash flow hedge				
Other current assets	\$ 32,481	\$ —	\$ —	\$ —
Other assets - long-term	14,108	—	—	—
Derivatives not designated as hedging instruments -Foreign exchange contracts				
Other current assets	\$ 726	\$ —	\$ —	\$ —
Other accrued liabilities	—	—	193	—

The following table summarizes the effects of our derivative instruments on our consolidated statements of operations for the years ended December 31, 2022, 2021 and 2020:

(In thousands)

Derivatives not designated as hedging instruments:	Consolidated Statements of Operations Location	2022	2021	2020
Foreign exchange contracts	Other expense, net	\$ (3,435)	\$ —	\$ —

The following table summarizes the effects of our derivative instruments on Accumulated Other Comprehensive Income for the years ended December 31, 2022, 2021 and 2020:

(In thousands)

	2022	2021	2020
Derivatives designated as hedging instruments:			
Interest rate swap contract - Cash flow hedge	\$ 36,069	\$ —	\$ —

We expect approximately \$32.5 million to be reclassified from Accumulated other comprehensive income into Interest expense, net during the next twelve months related to our interest rate swap based on projected rates of the SOFR forward curve as of December 31, 2022.

(13) OTHER EXPENSE (INCOME), NET

The table below sets forth the Other expense (income), net for the years ended December 31, 2022, 2021 and 2020:

(In thousands)

	2022	2021	2020
Loss (gain) on foreign currency remeasurement	\$ 23,034	\$ 7,857	\$ (9,751)
Loss on extinguishment of debt and modification	3,287	23,338	2,378
Other, net	(2,395)	500	717
Other expense (income), net	<u>\$ 23,926</u>	<u>\$ 31,695</u>	<u>\$ (6,656)</u>

(14) LEASES

As of December 31, 2022, the Company was obligated under operating lease agreements for certain office space and manufacturing facilities, manufacturing equipment, vehicles, information technology equipment and warehouse space. Our leases have remaining lease terms of 1 year to 19 years, some of which may include options to extend the lease for up to 10 years, and some of which may include options to terminate the leases within 1 year.

As of December 31, 2022 and 2021, the Company's operating lease components with initial or remaining terms in excess of one year were classified on the consolidated balance sheets as follows, together with certain supplemental balance sheet

information:

(In thousands)

	Classification	2022	2021
Assets			
Right-of-use assets	Right-of-use assets	\$ 94,940	\$ 66,563
Liabilities			
Short-term lease liability	Other accrued liabilities	19,025	10,638
Long-term lease liability	Long-term lease liability	80,716	60,101
Total lease liabilities		\$ 99,741	\$ 70,739
Lease Term and Discount Rate			
Weighted average remaining lease term (years)		7.8	9.2
Weighted average discount rate		4.1 %	4.2 %

Expense for leases less than 12 months for the year ended December 31, 2022, 2021 and 2020 were not material. The components of lease expense for the year ended December 31, 2022, 2021 and 2020 are as follows:

(In thousands)

	2022	2021	2020
Operating lease cost	\$ 17,997	\$ 13,127	\$ 13,576

The Company combines the amortization of the right-of-use assets and the change in the operating lease liability in the same line item in the Statement of Cash Flows. Other information related to the Company's operating leases for the year ended December 31, 2022, 2021 and 2020 are as follows:

(In thousands)

	2022	2021	2020
Cash paid for amounts included in the measurement of lease liabilities:			
Operating cash flows from leases	\$ 14,916	\$ 11,009	\$ 10,806
Right-of-use assets obtained in exchange for lease obligations:			
Operating leases	\$ 23,598	\$ 31,492	\$ 5,133

Future minimum lease payments for noncancellable operating leases as of December 31, 2022, were as follows:

(In thousands)

	2022
One Year	\$ 22,817
Two Years	18,252
Three Years	13,990
Four Years	11,919
Five Years	10,455
Beyond Five Years	39,863
Total	\$ 117,296
Less: Interest	17,555
Present value of lease liabilities	\$ 99,741

(15) ASSET RETIREMENT OBLIGATIONS

The Company has asset retirement obligations ("AROs") related to environmental disposal obligations associated with cylinders used to supply customers with gas products, and certain restoration obligations associated with certain of its leased facilities.

Changes in the carrying amounts of the Company's AROs for the years ended December 31, 2022 and 2021 are shown below:

<i>(In thousands)</i>	2022	2021
Balance at beginning of year	\$ 17,494	\$ 14,500
Liabilities assumed in acquisitions	12,531	—
Liabilities settled	(453)	(78)
Liabilities incurred	788	3,274
Accretion expense	213	166
Disposition	(2,815)	—
Revision of estimate	277	(368)
Balance at end of year	<u>\$ 28,035</u>	<u>\$ 17,494</u>

ARO liabilities expected to be settled within twelve months are included in the consolidated balance sheets in Other accrued liabilities, while all other ARO liabilities are included in Pension benefit obligations and other liabilities in the consolidated balance sheets.

(16) INCOME TAXES

Income before income taxes for the years ended December 31, 2022, 2021 and 2020 was derived from the following sources:

<i>(In thousands)</i>	2022	2021	2020
Domestic	\$ (272,365)	\$ 137,145	\$ 86,572
Foreign	519,445	341,931	267,715
Income before income tax expense	<u>\$ 247,080</u>	<u>\$ 479,076</u>	<u>\$ 354,287</u>

Income tax expense for the years ended December 31, 2022, 2021 and 2020 is summarized as follows:

<i>(In thousands)</i>	2022	2021	2020
Current:			
Federal	\$ 39,216	\$ 9,187	\$ 8,107
State	4,077	2,939	1,151
Foreign	97,611	76,257	57,310
	<u>140,904</u>	<u>88,383</u>	<u>66,568</u>
Deferred (net of valuation allowance):			
Federal	(90,238)	(11,726)	(592)
State	(5,749)	(498)	(407)
Foreign	(6,757)	(6,209)	(6,251)
	<u>(102,744)</u>	<u>(18,433)</u>	<u>(7,250)</u>
Income tax expense	<u>\$ 38,160</u>	<u>\$ 69,950</u>	<u>\$ 59,318</u>

Income tax expense differs from the expected amounts based upon the statutory federal tax rates for the years ended December 31, 2022, 2021 and 2020 as follows:

<i>(In thousands)</i>	2022	2021	2020
Expected federal income tax at statutory rate	\$ 51,887	\$ 100,606	\$ 74,400
State income taxes before valuation allowance, net of federal tax effect	(5,907)	(1,333)	(1,539)
Effect of foreign source income	(7,607)	(15,862)	(7,877)
Tax contingencies	5,762	4,696	1,688
Valuation allowance	8,052	9,984	9,281
U.S. federal research credit	(13,525)	(8,469)	(7,204)
Equity compensation	5,290	(8,899)	(8,231)
Foreign derived intangible income	(15,265)	(6,496)	(1,153)
Legal entity restructuring capital loss	—	(5,079)	—
Acquisition related retention, severance, and transaction costs	8,924	—	—
Other items, net	549	802	(47)
Income tax expense	<u>\$ 38,160</u>	<u>\$ 69,950</u>	<u>\$ 59,318</u>

The Company has made employment and spending commitments to Singapore. In return for those commitments, the Company was granted a partial tax holiday for eight years starting in 2013. During 2017, this agreement was extended to 2027 in exchange for revised employment and spending commitments. The income tax benefits attributable to the tax status are \$24.8 million (\$0.17 per diluted share), \$13.9 million (\$0.10 per diluted share) and \$9.4 million (\$0.07 per diluted share) for the years ending December 31, 2022, 2021 and 2020, respectively. The 2022, 2021 and 2020 effective tax rates include additional benefits of \$14.2 million, \$8.0 million and \$5.4 million because the corporate tax rate in Singapore is lower than the U.S. rate.

At December 31, 2022, there were approximately \$115.9 million of accumulated undistributed earnings of subsidiaries outside of the United States, all of which are considered to be indefinitely reinvested. Management estimates that approximately \$13.3 million of withholding taxes would be incurred if these undistributed earnings were distributed.

The significant components of the Company's deferred tax assets and deferred tax liabilities at December 31, 2022 and 2021 are as follows:

<i>(In thousands)</i>	2022	2021
Deferred tax assets attributable to:		
Accounts receivable	\$ 1,239	\$ 397
Inventory	14,862	6,510
Accruals not currently deductible for tax purposes	25,787	19,636
Net operating loss and credit carryforwards	57,760	42,599
Capital loss carryforward	895	485
Equity compensation	15,249	2,630
Other, net	5,670	7,786
Gross deferred tax assets	121,462	80,043
Valuation allowance	(48,047)	(39,383)
Total deferred tax assets	73,415	40,660
Deferred tax liabilities attributable to:		
Purchased intangible assets	(364,979)	(33,887)
Depreciation and Amortization	(2,719)	(9,102)
Total deferred tax liabilities	(367,698)	(42,989)
Net deferred tax liabilities	<u>\$ (294,283)</u>	<u>\$ (2,329)</u>

Deferred tax assets are generally required to be reduced by a valuation allowance if it is more likely than not that some portion or all of the deferred tax assets will not be realized.

As of December 31, 2022 and 2021, the Company had net U.S. deferred tax liabilities of \$298.5 million and deferred tax assets of \$3.0 million, respectively, which are composed of temporary differences and various tax credit carryforwards. Management believes that it is more likely than not that the benefit from certain state net operating loss carryforwards, state credit carryforwards and certain federal foreign tax credit carryforwards will not be realized. In recognition of this risk, management has provided valuation allowances of \$18.5 million and \$16.1 million as of December 31, 2022 and 2021, respectively, on the related deferred tax assets. If the assumptions change and management determines the assets will be realized, the tax benefits relating to any reversal of the valuation allowance on deferred tax assets at December 31, 2022 will be recognized as a reduction of income tax expense.

At December 31, 2022, the Company had state operating loss and credit carryforwards of approximately \$18.3 million, which began to expire in 2022, and foreign operating loss carryforwards of \$82.7 million, which begin to expire in 2023.

As of December 31, 2022 and 2021, the Company had net non-U.S. deferred tax assets of \$52.3 million and \$34 million, respectively, for which management determined based upon the available evidence a valuation allowance of \$29.5 million and \$23.3 million as of December 31, 2022 and 2021, respectively, was required against the non-U.S. gross deferred tax assets. For other non-U.S. jurisdictions, management relies upon projections of future taxable income to utilize deferred tax assets.

Benefits from tax positions should be recognized in the financial statements only when it is more likely than not that the tax positions will be sustained upon examination by the appropriate taxing authority that would have full knowledge of all relevant information. A tax position that meets the more-likely-than-not recognition threshold is measured at the largest amount of benefit that is greater than fifty percent likely of being realized upon ultimate settlement. Tax positions that fail to meet the more-likely-than-not recognition threshold should be recognized in the first subsequent financial reporting period in which that threshold is met. Previously recognized tax positions that no longer meet the more-likely-than-not recognition threshold should be derecognized in the first subsequent financial reporting period in which that threshold is no longer met. The provisions also provide guidance on the accounting for and disclosure of unrecognized tax benefits, interest and penalties.

Reconciliations of the beginning and ending balances of the total amounts of gross unrecognized tax benefits for the years ended December 31, 2022 and 2021 are as follows:

(In thousands)

	2022	2021
Gross unrecognized tax benefits at beginning of year	\$ 23,789	\$ 17,395
Increase from acquisition	24,452	—
Increase in tax positions from prior years	175	131
Decrease in tax positions from prior years	(248)	(69)
Increases in tax positions for current year	13,577	8,476
Settlement of tax positions for current year	(6,395)	(286)
Lapse in statute of limitations	(1,872)	(1,858)
Gross unrecognized tax benefits at end of year	\$ 53,478	\$ 23,789

The total amount of net unrecognized tax benefits that, if recognized, would affect the effective tax rate was \$42.3 million at December 31, 2022.

Penalties and interest paid or received are recorded in other income, net in the consolidated statements of operations. As of December 31, 2022 and 2021, the Company had accrued interest and penalties related to unrecognized tax benefits of \$4.2 million and \$5.9 million, respectively. Expenses of \$2.0 million, \$1.0 million and \$0.9 million were recognized as interest and penalties in the consolidated statements of operations for the years ended December 31, 2022, 2021 and 2020, respectively.

The Company files income tax returns in the U.S. and in various state, local and foreign jurisdictions. The statutes of limitations related to both the consolidated federal income tax return and state returns are closed for all years up to and including 2018 and 2018, respectively. With respect to foreign jurisdictions, the statute of limitations varies from country to country, with the earliest open year for the Company's major foreign subsidiaries being 2016.

Due to the expiration of various statutes of limitations and settlements of audits, it is reasonably possible that the Company's gross unrecognized tax benefit balance may decrease within the next twelve months by approximately \$2.6 million.

(17) EQUITY

Dividends

Holders of the Company's common stock are entitled to receive dividends when and if they are declared by the Company's board of directors. The Company's board of directors declared cash dividends of \$0.10 per share during each of the first, second, third and fourth quarters of 2022, payments for which totaled \$57.3 million. The Company's board of directors declared cash dividends of \$0.08 per share during each of the first, second, third and fourth quarters of 2021, payments for which totaled \$43.6 million. During 2020, the Company's board of directors declared cash dividends of \$0.08 per share during each of the first and second, third and fourth quarters of 2020, payments for which totaled \$43.5 million.

On January 18, 2023, the Company's board of directors declared a quarterly cash dividend of \$0.10 per share to be paid on February 22, 2023 to shareholders of record as of February 1, 2023.

Future dividend declarations, if any, as well as the record and payment dates for such dividends, are subject to the final determination of the Company's board of directors. Furthermore, the credit agreements governing the New Credit Facilities contain restrictions that may limit our ability to pay dividends.

Share Repurchase Program

On December 14, 2020, the Company's board of directors authorized a repurchase program, effective February 16, 2021, covering the repurchase of up to an aggregate of \$125.0 million of the Company's common stock, during a period of twelve months, in open market transactions and in accordance with one or more pre-arranged stock trading plans to be established in accordance with Rule 10b5-1 under the Securities Exchange Act of 1934, as amended. This repurchase program expired pursuant to its terms on February 15, 2022. In anticipation of its acquisition of CMC Materials, the Company suspended its previously announced share repurchase program in the fourth quarter of 2021 and does not anticipate authorizing a new repurchase program or resuming a repurchase program in 2023.

The Company repurchased \$0.0 million, \$67.1 million and \$44.6 million of shares for the years ended December 31, 2022, 2021 and 2020, respectively.

The credit agreement governing the New Credit Facilities contains restrictions that may limit the Company's ability to continue to repurchase shares.

2020 Stock Plan

In 2020, the Company's board of directors and stockholders approved the Entegris, Inc. 2020 Stock Plan (the "2020 Stock Plan"). The 2020 Stock Plan replaced the Entegris, Inc. 2010 Stock Plan for future stock awards and stock option grants. The 2020 Stock Plan has a term of ten years and provides for the issuance of stock options and other share-based awards to selected employees, directors, and other individuals or entities that provide services to the Company or its affiliates. Under the 2020 Stock Plan, the board of directors or a committee selected by the board of directors will determine for each award, the term, price, number of shares, rate at which each award is exercisable and whether restrictions are imposed on the shares subject to the awards. The exercise price for option awards generally may not be less than the fair market value per share of the underlying common stock on the date granted. The 2020 Stock Plan provides that after December 31, 2019, any shares subject to stock awards that were awarded from the Company's expired plans and that are forfeited, expired or otherwise terminated without issuance of shares will again be available for issuance under the 2020 Stock Plan.

Stock Plan assumed from CMC Materials

Subsequent to the acquisition of CMC Materials, the Company's Board of Directors approved the absorption of the CMC Materials 2021 Omnibus Incentive Plan (the "OIP") into the Company's 2020 Stock Plan for the remainder of the term of the OIP Plan. The 2021 OIP provides for grants of equity awards in the form of stock options, restricted stock, restricted stock units, stock appreciation rights, performance-based awards, other stock-based awards such as substitute awards in connection with an acquisition, and cash incentive awards. 3.9 million additional shares became available for grant by the Company upon absorption of the OIP Plan.

Each outstanding option to purchase shares of CMC Materials common stock under CMC Materials's stock plan became an option to acquire, on the same terms and condition as were applicable under the CMC Materials stock plan, the Company's common stock, with the number of shares and exercise prices thereof adjusted for the exchange ratio of 1.82. Accordingly, options to purchase 0.6 million shares of CMC Materials common stock were exchanged for options to purchase 1.2 million shares of the Company's common stock.

Each outstanding performance-based restricted stock unit of CMC Materials under CMC Materials's stock plan became a time-based restricted stock unit with the same terms and conditions as were applicable under the CMC Materials stock plan, the Company's common stock, with the number of shares and exercise price thereof adjusted for the exchange ratio of 1.82. Accordingly, 0.1 million shares of performance-based restricted stock units of CMC Materials common stock were exchanged for restricted stock units of 0.2 million shares of the Company's common stock.

For all plans, exclusive of the employee stock purchase plan, the Company had shares available for future grants of 10.9 million, 8.7 million, and 9.0 million shares at December 31, 2022, 2021 and 2020, respectively.

Stock Options

Stock option activity for the years ended December 31, 2022, 2021 and 2020 is summarized as follows:

	2022		2021		2020	
	Number of shares	Weighted average exercise price	Number of shares	Weighted average exercise price	Number of shares	Weighted average exercise price
<i>(Shares in thousands)</i>						
Options outstanding, beginning of year	657	\$ 55.32	1,082	\$ 33.38	1,575	\$ 21.39
Granted	146	128.44	167	98.11	216	55.72
Assumed in CMC acquisition	1,178	55.80	—	—	—	—
Exercised	(141)	40.00	(592)	27.32	(709)	13.60
Cancelled or forfeited	(1)	61.42	—	—	—	—
Options outstanding, end of year	1,839	\$ 62.59	657	\$ 55.32	1,082	\$ 33.38
Options exercisable, end of year	1,386	\$ 54.53	111	\$ 34.54	426	\$ 24.99

Options outstanding under the Company's stock plans at December 31, 2022 are summarized as follows:

(Shares in thousands)

Range of exercise prices	Options outstanding			Options exercisable	
	Number outstanding	Weighted average remaining life in years	Weighted-average exercise price	Number exercisable	Weighted average exercise price
\$— to \$31.10	343	1.9 years	\$ 24.89	343	\$ 24.89
\$31.11 to \$43.47	222	3.4 years	34.05	149	34.40
\$43.48 to \$55.72	260	3.7 years	53.83	151	52.47
\$55.73 to \$80.00	663	4.5 years	70.29	663	70.29
\$80.01 to \$128.44	351	5.6 years	109.43	80	92.50
	<u>1,839</u>	4.0 years	\$ 62.59	<u>1,386</u>	\$ 54.53

The weighted average remaining contractual term for options outstanding and options exercisable for all plans at December 31, 2022 was 4.0 years and 3.7 years, respectively.

Under the stock plans, the total pre-tax intrinsic value of stock options exercised during the years ended December 31, 2022 and 2021 was \$11.4 million and \$54.7 million, respectively. The aggregate intrinsic value, which represents the total pre-tax intrinsic value based on the Company's closing stock price of \$65.59 at December 31, 2022, which theoretically could have been received by the option holders had all option holders exercised their options as of that date, was \$25.7 million and \$22.3 million for options outstanding and options exercisable, respectively.

Share-based payment awards in the form of stock option awards for 0.1 million, 0.2 million and 0.2 million shares were granted to employees during the years ended December 31, 2022, 2021 and 2020, respectively. Compensation expense is based on the grant date fair value. The awards vest annually over a period of four years and have a contractual term of 7 years. The Company estimates the fair value of stock options using the Black-Scholes valuation model. Key inputs and assumptions used to estimate the fair value of stock options include the grant price of the award, the expected option term, volatility of the Company's stock, the risk-free rate and the Company's dividend yield. Estimates of fair value are not intended to predict actual future events or the value ultimately realized by employees who receive equity awards, and subsequent events are not indicative of reasonableness of the original estimates of fair value made by the Company.

The fair value of each stock option grant was estimated at the date of grant using a Black-Scholes option pricing model. The following table presents the weighted-average assumptions used in the valuation and the resulting weighted-average fair value per option granted for the years ended December 31, 2022, 2021 and 2020:

Employee stock options:	2022	2021	2020
Volatility	40.9 %	38.0 %	31.9 %
Risk-free interest rate	1.5 %	0.4 %	1.4 %
Dividend yield	0.3 %	0.3 %	0.6 %
Expected life (years)	4.2	4.6	4.3
Weighted average fair value per option	\$ 43.47	\$ 30.69	\$ 14.83

A historical daily measurement of volatility is determined based on the expected life of the option granted. The risk-free interest rate is determined by reference to the yield on an outstanding U.S. Treasury note with a term equal to the expected life of the option granted. Expected life is determined by reference to the Company's historical experience. The Company determines the dividend yield by dividing the expected annual dividend on the Company's stock by the option exercise price.

Employee Stock Purchase Plan

The Company maintains the Entegris, Inc. Amended and Restated Employee Stock Purchase Plan ("ESPP"). The ESPP allows employees to elect, at six-month intervals, to contribute up to 10% of their compensation, subject to certain limitations, to purchase shares of the Company's common stock at a discount of 15% from the fair market value on the first day or last day of each six-month period. The Company treats the ESPP as a compensatory plan. At December 31, 2022, 1.3 million shares remained available for issuance under the ESPP. Employees purchased 0.2 million, 0.1 million and 0.2 million shares, at a weighted-average price of \$65.25, \$90.89, and \$46.58 during the years ended December 31, 2022, 2021 and 2020, respectively.

Restricted Stock Units

Restricted stock units are awards of common stock made under the Stock Plans that are subject to a risk of forfeiture if the awardee terminates employment with the Company prior to the lapse of the restrictions. The value of such restricted stock units is determined using the market price on the grant date. Compensation expense for restricted stock units is generally recognized using the straight-line single-option method. A summary of the Company's restricted stock unit activity for the years ended December 31, 2022, 2021 and 2020 is presented in the following table:

	2022		2021		2020	
	Number of shares	Weighted average grant date fair value	Number of shares	Weighted average grant date fair value	Number of shares	Weighted average grant date fair value
<i>(Shares in thousands)</i>						
Unvested, beginning of year	897	\$ 62.69	1,083	\$ 41.31	1,254	\$ 27.48
Granted	366	117.82	293	101.04	437	57.46
Assumed in CMC acquisition	155	92.96	—	—	—	—
Vested	(523)	64.77	(439)	35.58	(564)	23.48
Forfeited	(51)	85.16	(40)	57.39	(44)	35.86
Unvested, end of year	<u>844</u>	<u>90.37</u>	<u>897</u>	<u>62.69</u>	<u>1,083</u>	<u>41.31</u>

During the years ended December 31, 2022, 2021 and 2020, the Company awarded performance-based restricted stock units for up to 0.1 million, 0.1 million and 0.1 million shares of common stock, respectively, to be issued upon the achievement of performance conditions under the Company's stock plans to certain officers. Compensation expense is based on the grant date fair value. The awards vest on the third anniversary of the award date. The Company estimates the fair value of the performance shares using a Monte Carlo simulation process.

As of December 31, 2022, the total compensation cost related to unvested stock options, performance-based restricted stock units and restricted stock unit awards not yet recognized was \$3.7 million, \$2.8 million and \$43.4 million, respectively, and is expected to be recognized over the next 2.5 years on a weighted-average basis.

Modifications

During the three months ended October 1, 2022, the Company modified all employee awards of restricted share units, options, and performance-based restricted share units that were granted in the 2022 fiscal year to provide that the awards will generally vest in connection with the grantee's qualifying retirement. The Company accounted for this as a modification of awards and recognized incremental compensation cost of \$15.3 million. The incremental compensation cost is measured as the accelerated expense over the requisite service period. The fair-value-based measure of the modified awards was the same as the fair-value based measure of the original award immediately before modification because the modification only affects the service period of the award.

In addition during the three months ended October 1, 2022, the Company modified restricted share units, options, and performance-based restricted share units granted prior to the 2022 fiscal year for two employees to accelerate the unvested awards upon their respective retirements from the Company. The Company accounted for this as a modification of awards and recognized incremental compensation cost of \$6.2 million. The incremental compensation cost is measured as the excess of the fair value of the modified award over the fair value of the original award immediately before its terms modified and recognized as compensation cost on the date of the modification for the vested awards.

Valuation and Expense Information

The Company recognizes compensation expense for all share-based payment awards made to employees and directors based on their estimated fair values on the date of grant. Compensation expense is recognized using the straight-line attribution method to recognize share-based compensation over the service period of the award, with adjustments recorded for forfeitures as they occur. Awards issued to employees who are retirement eligible or nearing retirement eligibility are expensed on an accelerated basis. The following table summarizes the allocation of share-based compensation expense related to employee stock options, restricted stock awards, performance-based restricted stock awards and grants under the employee stock purchase plan for the

years ended December 31, 2022, 2021 and 2020:

<i>(In thousands)</i>	2022	2021	2020
Cost of sales	\$ 5,780	\$ 3,844	\$ 1,463
Engineering, research and development expenses	4,596	3,504	2,359
Selling, general and administrative expenses	56,201	22,536	19,098
Share-based compensation expense	\$ 66,577	\$ 29,884	\$ 22,920
Tax benefit	13,977	5,488	4,129
Share-based compensation expense, net of tax	\$ 52,600	\$ 24,396	\$ 18,791

(18) BENEFIT PLANS

401(k) Plan

The Company has 401(k) defined contribution plans covering employees in the U.S. The related expense totaled \$21.9 million, \$10.1 million and \$8.2 million in the fiscal years ended December 31, 2022, 2021 and 2020, respectively. The increase in the 2022 expense compared to the prior year is due primarily to the CMC Materials acquisition for the U.S. employees covered under the 401(k) defined contribution plan and under the Entegris, Inc 401(k) Savings and Profit Sharing Plan the Company's match increased from 4% to 5%. The Company's United Kingdom, Singapore and Korea subsidiaries also make immaterial contributions to retirement plans that function as defined contribution retirement plans.

Defined Benefit Plans

The employees of the Company's subsidiaries in Japan, Taiwan, South Korea, France and Germany are covered in defined benefit pension plans. As part of the CMC Materials acquisition in 2022, the Company assumed \$10.1 million of projected benefit obligation. The Company uses a December 31 measurement date for its pension plans. A summary of these combined plans are:

<i>(In thousands)</i>	2022	2021
Projected benefit obligation	\$ 15,253	\$ 7,050
Fair value of plan assets	1,014	969
Plan assets less benefit obligation - net amount recognized	(14,239)	(6,081)
Accumulated benefit obligation	12,151	5,995

Cash Flows

Benefits for the combined plans were \$0.7 million, \$0.1 million and \$0.1 million in fiscal years 2022, 2021 and 2020, respectively, consisting primarily of service costs. Net service costs are included in Cost of sales and Operating expenses, and all other costs are recorded in Other expense, net in our Consolidated Statements of Operations. The Company expects to make the following contributions and benefit payments:

<i>(In thousands)</i>	Payments
2023	\$ 735
2024	779
2025	1,264
2026	1,127
2027	922
Years 2028-2032	5,940

(19) EARNINGS PER SHARE ("EPS")

Basic EPS is computed by dividing net income by the weighted average number of shares of common stock outstanding during each period. The following table presents a reconciliation of the share amounts used in the computation of basic and diluted earnings per share:

<i>(In thousands)</i>	2022	2021	2020
Basic earnings per share—Weighted common shares outstanding	142,294	135,411	134,837
Weighted common shares assumed upon exercise of options and vesting of restricted stock units	852	1,163	1,429
Diluted earnings per share—Weighted common shares outstanding	143,146	136,574	136,266

The Company excluded the following shares underlying stock-based awards from the calculations of diluted EPS because their inclusion would have been anti-dilutive for the years ended December 31, 2022, 2021 and 2020:

(In thousands)

	2022	2021	2020
Shares excluded from calculations of diluted EPS	447	136	195

(20) SEGMENT INFORMATION

Effective July 6, 2022, coincident to and in conjunction with the CMC acquisition (see Note 3 to the consolidated financial statements) the Company changed its financial segment reporting to reflect management and organizational changes made by the Company. Accordingly, our segment information was recast retroactively in the third quarter of fiscal 2022 to conform to the current year presentation.

The Company's financial segment reporting reflects an organizational alignment intended to leverage the Company's unique breadth of capabilities to create mission-critical microcontamination control products, advanced materials, specialty chemicals and advanced materials handling solutions that maximize manufacturing yields, reduce manufacturing costs and enable higher device performance for its customers. These segments share common business systems and processes, technology centers and technology roadmaps. The Company leverages its expertise from these four segments to create new and increasingly integrated solutions for its customers. The Company reports its financial performance in the following segments:

- **Specialty Chemicals and Engineered Materials:** SCEM provides high-performance and high-purity process chemistries, gases and materials, and safe and efficient materials delivery systems to support semiconductor and other advanced manufacturing processes.
- **Microcontamination Control:** MC offers solutions to filter and purify critical liquid and gaseous chemistries used in semiconductor manufacturing processes and other high-technology industries.
- **Advanced Materials Handling:** AMH develops solutions to monitor, protect, transport and deliver critical liquid chemistries, wafers and other substrates for a broad set of applications in the semiconductor industry, life sciences and other high-technology industries.
- **Advanced Planarization Solutions:** APS provides complementary chemical mechanical planarization solutions, advanced materials and high-purity wet chemicals; including CMP slurries, pads, formulated cleans and other electronic chemicals

Segment profit is defined as net sales less direct and indirect segment operating expenses, including certain general and administrative costs for the Company's human resources, finance and information technology functions. The Company generally accounts for inter-segment sales and transfers as if the sales or transfers were to third parties, that is, at approximate market prices. Inter-segment sales are presented as an elimination below. The remaining unallocated expenses consist mainly of the Company's corporate functions as well as interest expense, interest income, amortization of intangible assets and income tax expense.

Corporate assets consist primarily of cash and cash equivalents, deferred tax assets and deferred tax charges.

Summarized financial information for the Company's reportable segments is shown in the following tables:

<i>(In thousands)</i>	2022	2021	2020
Net sales:			
SCEM	\$ 773,594	\$ 625,670	\$ 530,040
MC	1,105,996	919,363	742,186
AMH	846,492	704,946	538,682
APS	606,614	85,621	79,492
Inter-segment elimination	(50,663)	(36,707)	(31,087)
Total net sales	<u>\$ 3,282,033</u>	<u>\$ 2,298,893</u>	<u>\$ 1,859,313</u>

<i>(In thousands)</i>	2022	2021	2020
Segment profit:			
SCEM	\$ 122,287	\$ 137,392	\$ 99,474
MC	411,475	321,300	248,910
AMH	183,738	159,995	111,028
APS	96,902	30,415	28,495
Total segment profit	<u>\$ 814,402</u>	<u>\$ 649,102</u>	<u>\$ 487,907</u>

<i>(In thousands)</i>	2022	2021	2020
Total assets:			
SCEM	\$ 1,671,456	\$ 971,678	\$ 866,029
MC	1,161,636	946,336	819,602
AMH	801,591	598,547	437,322
APS	5,864,250	219,787	156,328
Corporate	639,924	455,548	638,415
Total assets	<u>\$ 10,138,857</u>	<u>\$ 3,191,896</u>	<u>\$ 2,917,696</u>

<i>(In thousands)</i>	2022	2021	2020
Depreciation and amortization:			
SCEM	\$ 76,550	\$ 57,995	\$ 62,770
MC	42,514	41,536	39,775
AMH	33,490	29,648	25,231
APS	126,770	8,988	8,647
Corporate	—	—	99
Total depreciation and amortization	<u>\$ 279,324</u>	<u>\$ 138,167</u>	<u>\$ 136,522</u>

<i>(In thousands)</i>	2022	2021	2020
Capital expenditures:			
SCEM	\$ 105,057	\$ 68,058	\$ 49,711
MC	178,800	69,120	40,656
AMH	136,061	67,096	36,107
APS	46,274	6,352	5,278
Total capital expenditures	<u>\$ 466,192</u>	<u>\$ 210,626</u>	<u>\$ 131,752</u>

The following table reconciles total segment profit to income before income taxes and equity in net loss of affiliate:

<i>(In thousands)</i>	2022	2021	2020
Total segment profit	\$ 814,402	\$ 649,102	\$ 487,907
Less:			
Amortization of intangibles	143,953	47,856	53,092
Unallocated general and administrative expenses	190,468	49,478	39,370
Operating income	\$ 479,981	\$ 551,768	395,445
Interest expense	212,669	41,240	48,600
Interest income	(3,694)	(243)	(786)
Other expense (income), net	23,926	31,695	(6,656)
Income before income tax expense	\$ 247,080	\$ 479,076	\$ 354,287

In the following tables, revenue is disaggregated by country or region based on the ship to location of the customer for the years ended December 31, 2022, 2021 and 2020:

	2022					
<i>(In thousands)</i>	SCEM	MC	AMH	APS	Inter-segment	Total
North America	\$ 272,696	\$ 158,627	\$ 265,510	\$ 149,489	\$ (50,663)	\$ 795,659
Taiwan	111,921	305,899	151,663	90,644	—	660,127
South Korea	78,675	129,750	121,726	83,926	—	414,077
Japan	87,452	183,485	59,278	19,787	—	350,002
China	95,184	184,609	119,325	102,838	—	501,956
Europe	66,938	85,696	88,405	83,976	—	325,015
Southeast Asia	60,728	57,930	40,585	75,954	—	235,197
	<u>\$ 773,594</u>	<u>\$ 1,105,996</u>	<u>\$ 846,492</u>	<u>\$ 606,614</u>	<u>\$ (50,663)</u>	<u>\$ 3,282,033</u>

	2021					
<i>(In thousands)</i>	SCEM	MC	AMH	APS	Inter-segment	Total
North America	\$ 191,717	\$ 133,653	\$ 219,853	\$ 17,280	\$ (36,707)	\$ 525,796
Taiwan	96,069	225,086	111,968	20,987	—	454,110
South Korea	76,270	114,211	105,493	21,298	—	317,272
Japan	86,442	161,569	51,267	3,325	—	302,603
China	91,272	164,471	97,157	11,519	—	364,419
Europe	43,703	70,011	89,121	6,433	—	209,268
Southeast Asia	40,197	50,362	30,087	4,779	—	125,425
	<u>\$ 625,670</u>	<u>\$ 919,363</u>	<u>\$ 704,946</u>	<u>\$ 85,621</u>	<u>\$ (36,707)</u>	<u>\$ 2,298,893</u>

	2020					
<i>(In thousands)</i>	SCEM	MC	AMH	APS	Inter-segment	Total
North America	\$ 168,270	\$ 144,015	\$ 164,576	\$ 20,739	\$ (31,087)	\$ 466,513
Taiwan	85,406	171,201	94,339	21,259	—	372,205
South Korea	69,235	91,997	92,623	19,345	—	273,200
Japan	71,242	124,321	45,209	2,124	—	242,896
China	68,625	108,588	61,458	9,192	—	247,863
Europe	32,746	67,090	52,321	2,281	—	154,438
Southeast Asia	34,516	34,974	28,156	4,552	—	102,198
	<u>\$ 530,040</u>	<u>\$ 742,186</u>	<u>\$ 538,682</u>	<u>\$ 79,492</u>	<u>\$ (31,087)</u>	<u>\$ 1,859,313</u>

The following table summarizes property, plant and equipment, net, attributed to significant countries for the years ended December 31, 2022, 2021 and 2020:

<i>(In thousands)</i>	2022	2021	2020
Property, plant and equipment:			
North America	\$ 776,913	\$ 417,549	\$ 348,363
South Korea	84,253	58,725	55,404
Japan	104,282	56,357	41,044
Malaysia	46,703	29,443	32,727
China	253,285	32,133	29,528
Taiwan	31,592	58,444	17,050
Other	96,309	1,447	1,251
	<u>\$ 1,393,337</u>	<u>\$ 654,098</u>	<u>\$ 525,367</u>

The Company reported net sales of 10 percent or more for one customer in the amount of \$408.6 million, \$271.9 million and \$208.3 million for the years ended December 31, 2022, 2021 and 2020, respectively, all of which include sales from all the Company's segments.

(21) COMMITMENTS AND CONTINGENT LIABILITIES

We are involved in certain legal actions. The outcomes of these legal actions are not within our complete control and may not be known for prolonged periods of time. In some actions, the claimants seek damages, as well as other relief, that could require significant expenditures or result in lost revenues. We record a liability for these legal actions when a loss is known or considered probable and the amount can be reasonably estimated. If the reasonable estimate of a known or probable loss is a range, and no amount within the range is a better estimate than any other, the minimum amount of the range is accrued. There is judgment required in the determination of the likelihood of outcome, and if necessary determination of the estimate or range of potential outcomes. Based on the current information, the Company does not believe any known matters have a reasonable possibility of a material amount for litigation or other contingencies related to legal proceedings.

(22) QUARTERLY INFORMATION-UNAUDITED

<i>(In thousands, except per share data)</i>	Fiscal quarter ended			
	April 2, 2022	July 2, 2022	October 1, 2022	December 31, 2022
Net sales	\$ 649,646	\$ 692,489	\$ 993,828	\$ 946,070
Gross profit	309,820	310,397	371,671	404,525
Net income (loss)	125,705	99,491	(73,703)	57,427
Basic net income (loss) per common share	0.93	0.73	(0.50)	0.39
Diluted net income (loss) per common share	0.92	0.73	(0.50)	0.38

<i>(In thousands, except per share data)</i>	Fiscal quarter ended			
	April 3, 2021	July 3, 2021	October 2, 2021	December 31, 2021
Net sales	\$ 512,844	\$ 571,352	\$ 579,493	\$ 635,204
Gross profit	234,986	265,384	264,204	295,090
Net income	84,676	88,770	117,461	118,219
Basic net income per common share	0.63	0.66	0.87	0.87
Diluted net income per common share	0.62	0.65	0.86	0.87

(23) SUBSEQUENT EVENTS

On January 20, 2023, the Company announced a definitive agreement for Quad-C Management to acquire the QED business, which became part of the Company with the recent acquisition of CMC Materials. The selling price is expected to be approximately \$135.0 million, subject to customary purchase price adjustments. The sale is currently expected to close in the first quarter of 2023, subject to the satisfaction of certain customary closing conditions, including, among others, receipt of regulatory approval. The Company does not expect a material gain or loss from the sale of the QED business.

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