
At last . . .
technology that can unleash the
Graphene Revolution
AVADAIN™
March 2022
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Forward Looking Statements

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INVESTMENT OPPORTUNITY

- Graphene can change our world. Experts believe that graphene will be vastly more important to the 21st Century than plastics were to the 20th Century
- Many leading tech companies & numerous startups are poised to enhance hundreds of products with graphene; ‘flakes’ are industry’s preferred form factor of graphene
- Mass production of graphene-enabled products is held back because **there is no technology to produce industrial quantities of reasonably priced high-quality graphene flakes**
- *Avadain* has **successfully demonstrated a breakthrough, globally patented & green manufacturing batch process**
- We have the team, including strong partners, to **upscale to mass production** to meet existing & projected demand for excellent quality flakes
- Driven by our experienced team, ***Avadain* plans to license its technology** to advanced materials manufacturers, enabling rapid growth
- If we achieve lucrative, recurring licensing revenue streams, *Avadain* could be an **attractive acquisition candidate**

Key Investment Highlights

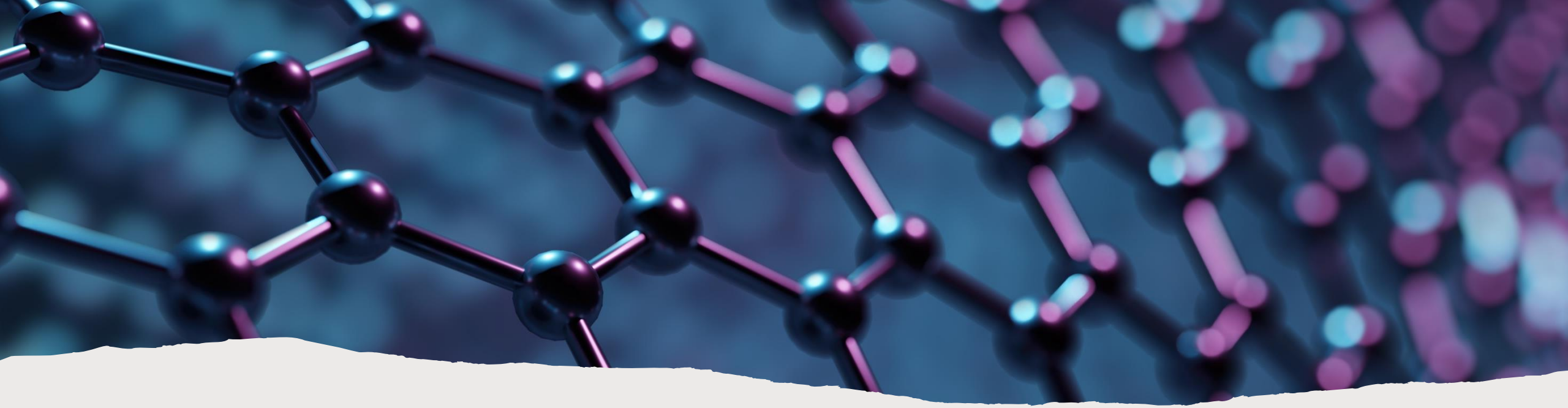
- IP-protected, breakthrough technology
- Strong manufacturing development partners
- Rapid, flexible commercial scaling
- Licensing business model = capital light + recurring revenue
- Market inflection point – *now*
- Experienced leadership team

Problem

Today, companies are forced to work with suboptimal quality materials referred to as ‘graphene’ but are, in reality, graphene oxide, graphene nanoplatelets & graphite

Flakes are the preferred form factor of graphene. But for most applications, there is no source of consistent and larger than >30 μm^2, ≤5 atomic layers & almost defect free graphene flakes. This has held back the Graphene Revolution

Virtually no companies are currently focused on manufacturing industrial quantities of high-quality graphene flakes

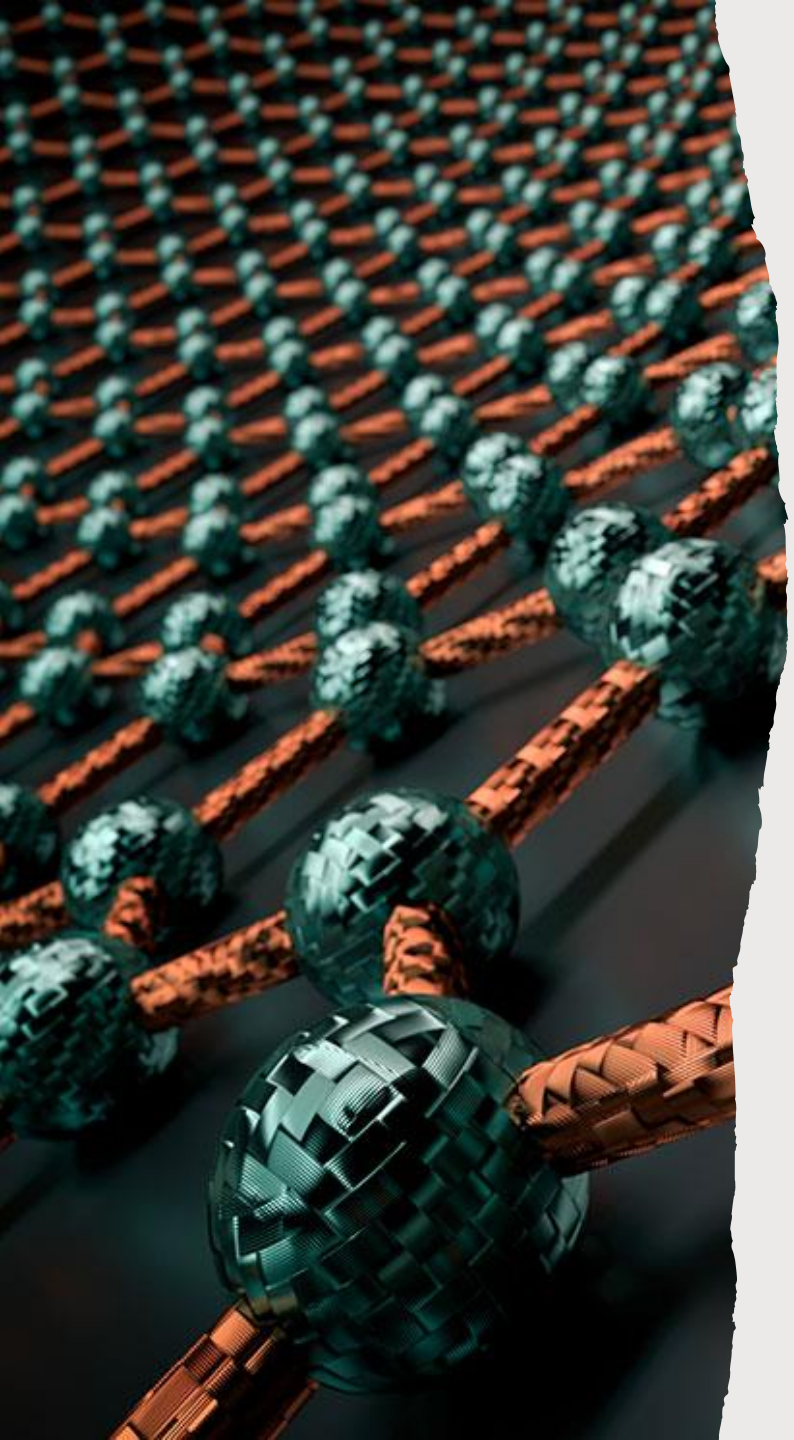


Solution

Avadain has a globally patented, breakthrough & proven technology to reliably manufacture very high-quality graphene flakes using a safe, environmentally friendly batch process

Avadain's superior large, thin & very few defect flakes produced in industrial volumes at nominal cost should meet the need of >80% of the multi-billion dollar market for graphene flakes

We believe there is significant pent-up demand from many clean tech, deep tech, industrial, manufacturing & life sciences companies for our flakes



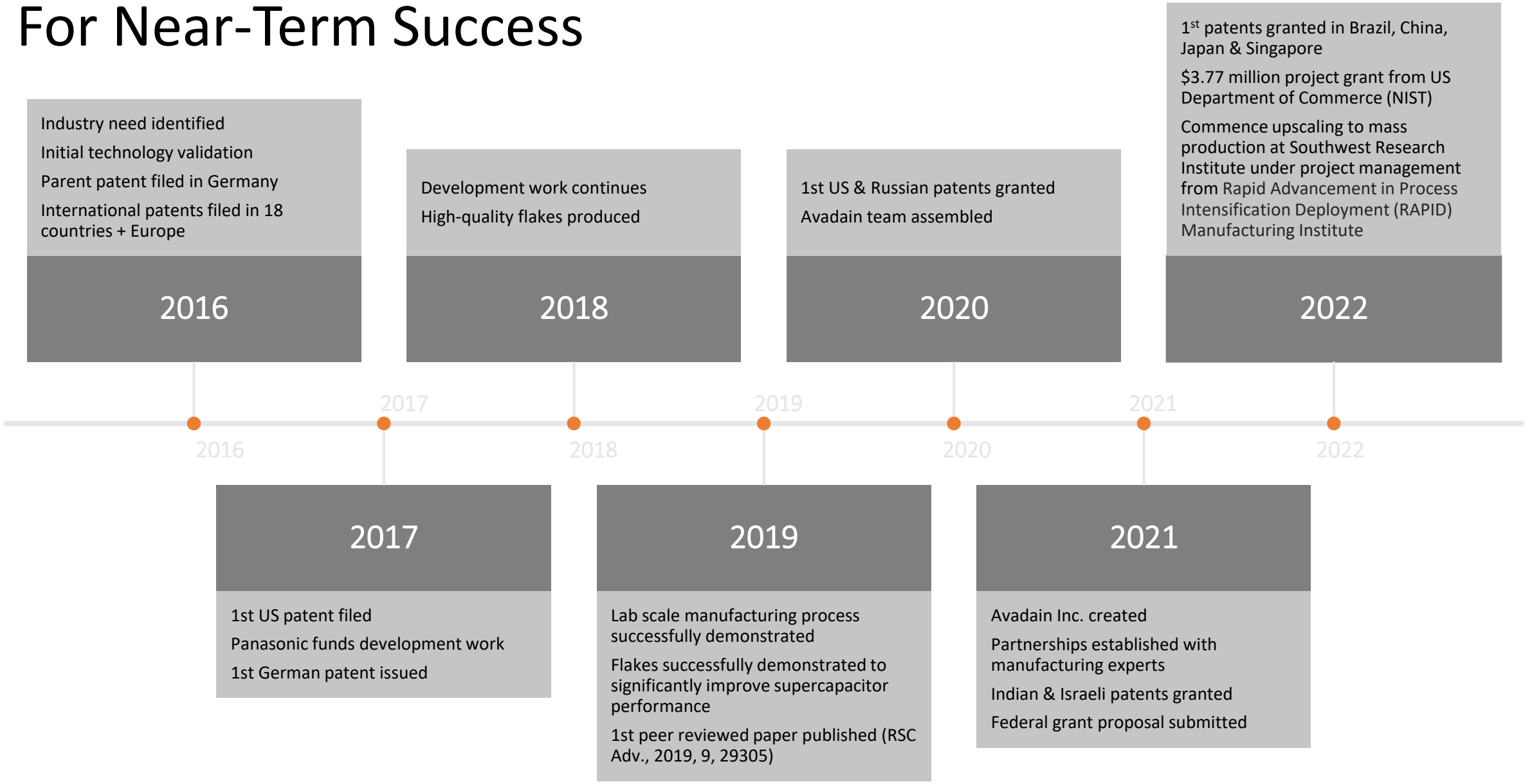
Avadain's Breakthrough Technology Can Overcome the Three Obstacles to Widespread Use of Graphene Flakes – Quality, Price & Quantity

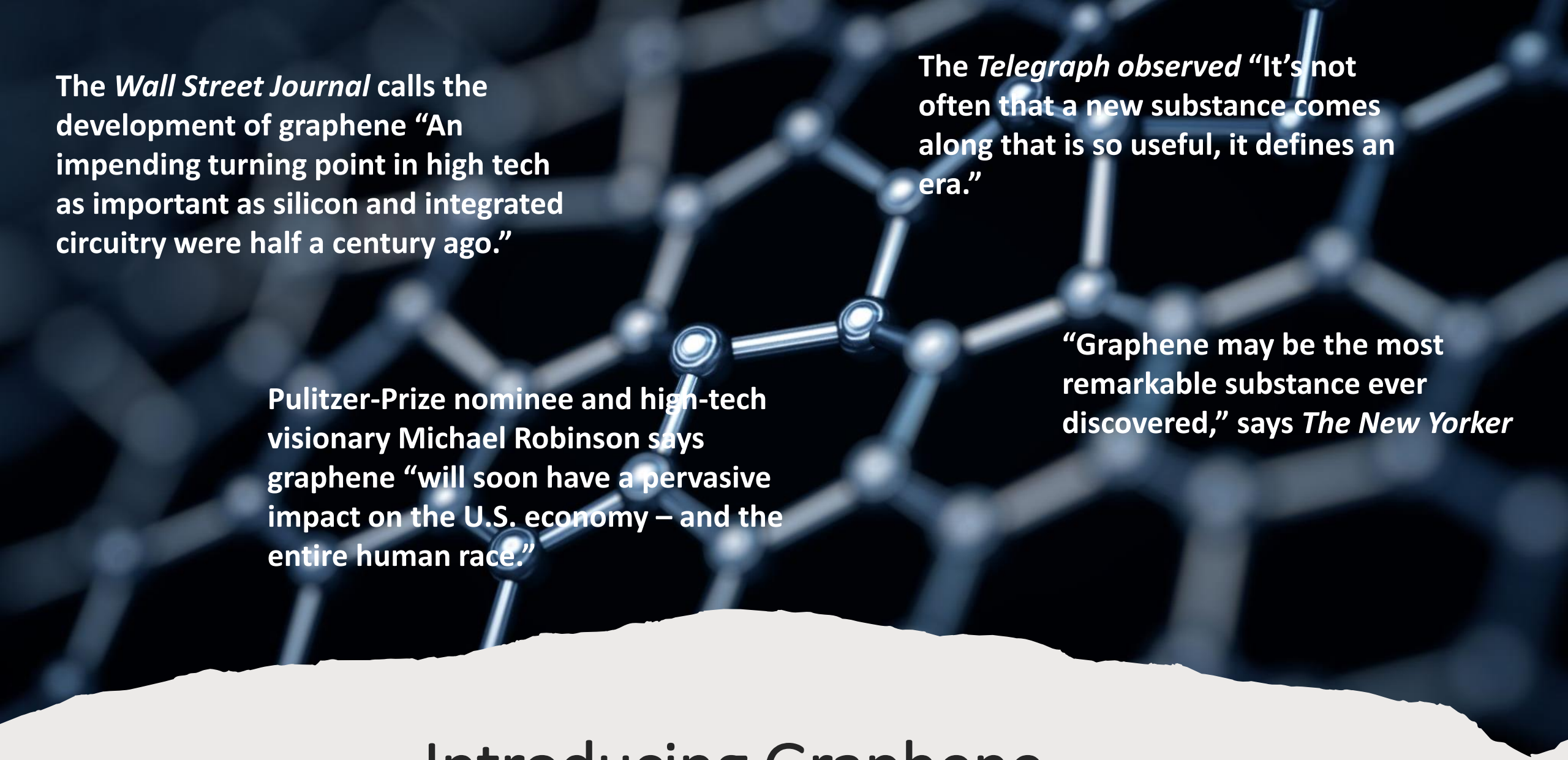
Quality – *Avadain's* process eliminates most defects while manufacturing consistently large flakes with excellent electrical & thermal conductivity, in addition to high mechanical strength

Price – *Avadain's* electrochemical exfoliation & expansion enables manufacturing flakes at a price acceptable to industry

Quantity – *Avadain's* environmentally-friendly technology makes industrial scale production possible

Achievements Have Positioned *Avadain* For Near-Term Success

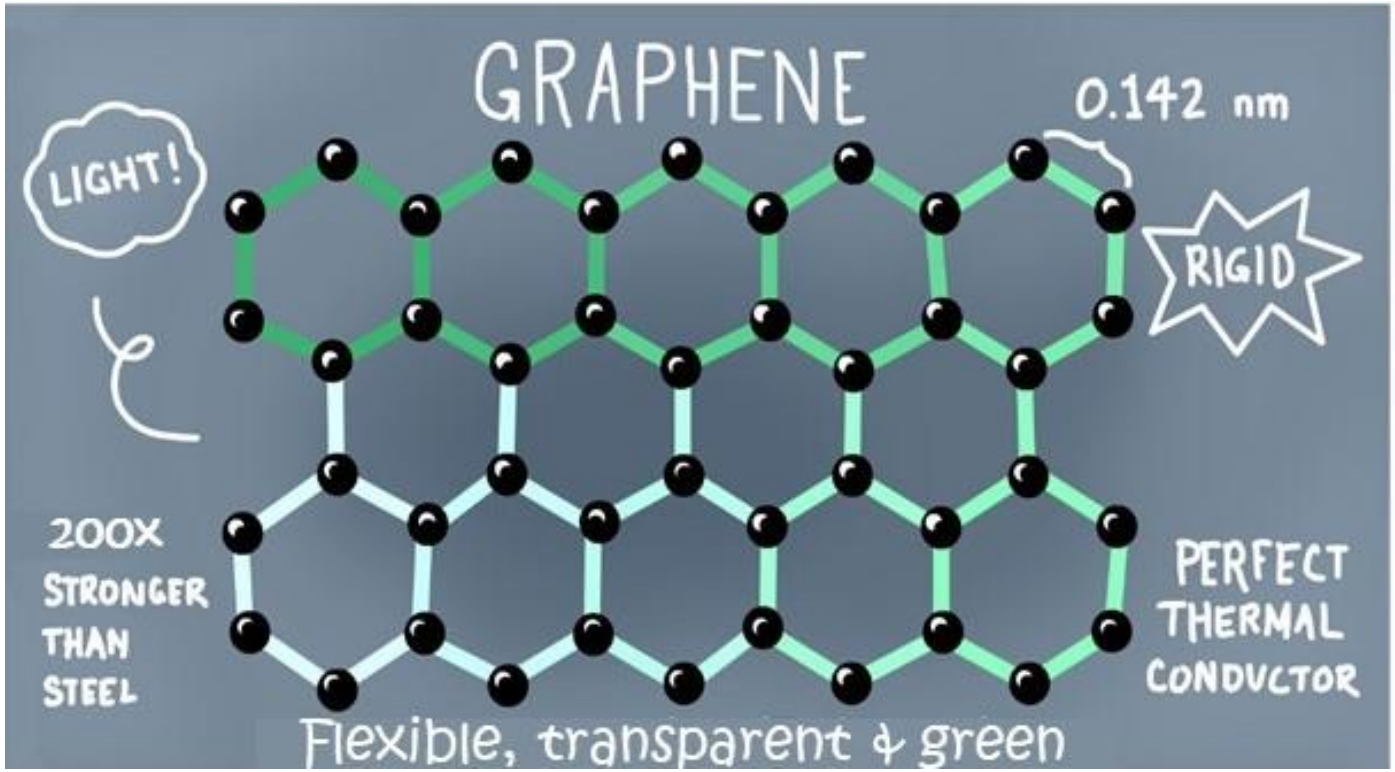




Introducing Graphene

The word “super-material” is overused. But one super-material appears to dwarf them all. It has the potential to revolutionize electric vehicle batteries, composites, supercapacitors, sensors, 3D printing, energy storage, medicine & solar cells ... to name just a very few. It’s called ‘graphene’, and it is the genesis of the modern boom in materials science. Engineers believe graphene is one of the most disruptive materials of all time. It is the lightest, strongest, thinnest, best thermally & electrically-conducting material ever discovered

Graphene “*is not even one material. It is a huge range of materials. A good comparison would be to how plastics are used*,“ says Nobel Laureate Andre Geim



“***Adding 0.01%-0.50% to other materials can drastically improve their properties***.”
- G6 Materials Corp.

Graphene’s Unique Qualities

Strength (150,000,000 psi) – 200*x* stronger than steel

Flexibility – bendable

Thin – 1 million times thinner than a sheet of paper

Light – a 1 gram sheet would cover a soccer field

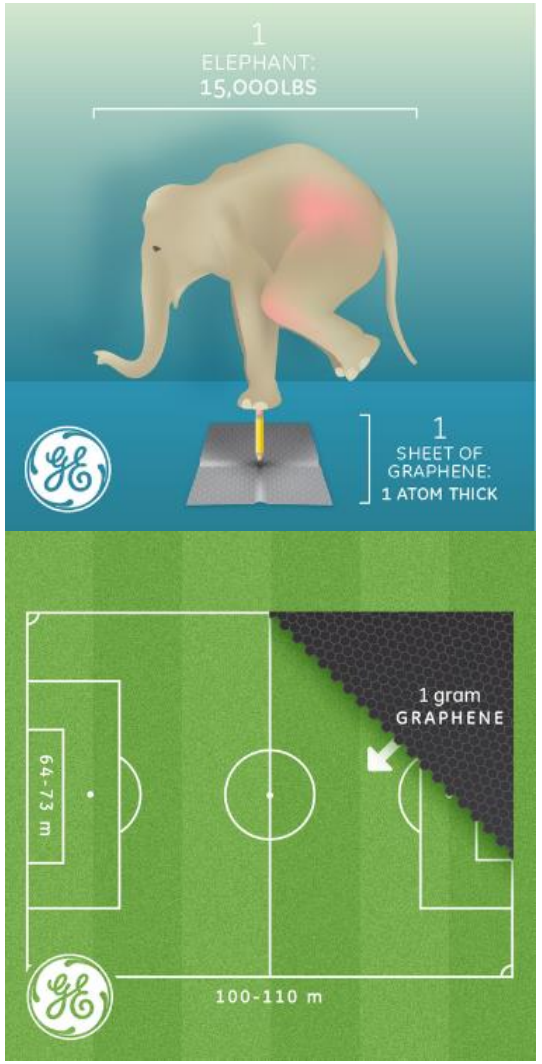
Heat conductivity – best material for conducting heat

Electrical conductivity – nearly perfect conductor

Electronic properties – electrons move through graphene at close to the speed of light

Invisibility – transmits 97% of light (glass window transmits 80%-90%)

Impermeability – enables water filtration & purification



"*In terms of the speed of the transistor, we currently see no intrinsic limits into how fast it can go*," says Dr Yu-ming Lin of IBM

Huge Pent-Up Demand for high-quality Graphene Flakes

A broad swath of industries have an immediate, pressing need for tens of tons of high-quality graphene flakes. Once a reliable source of supply is available, we anticipate demand will quickly grow to the hundreds of tons

Federal agencies, such as DOD, NASA, DOE, NRO & others, urgently need a reliable source of industrial quantities of this strategically critical material

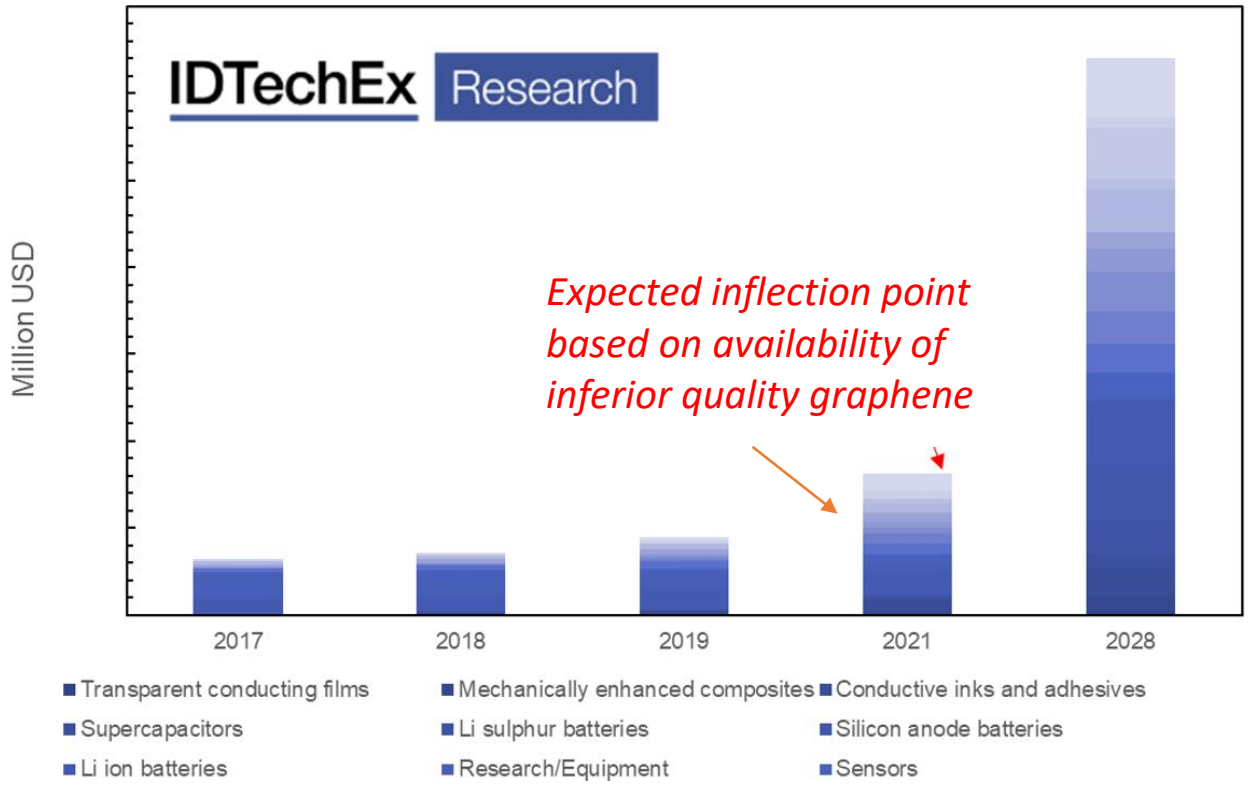
The US must compete with China's concerted efforts to dominate the global graphene supply chain

As the National Reconnaissance Office observed, "*The challenge is producing it in large quantities*"

The Timing is Right

2021 – Graphene's Inflection Point

Emerging technologies research firm IDTechEx says 2020-2021 was the inflection point for the Graphene Age



"The market for graphene is at a tipping point, with long periods of R&D now starting to translate into significant purchase orders. For a long time, the graphene market was overwhelmingly driven by a 'materials push' . . .. Now, that has transitioned into 'market pull' . . .."

- IDTechEx Principal Analyst, Dr Richard Collins

2021 - lightest 5G smartphone with graphene battery

2020 - device power charging; face masks; biological transistors; rubber shoes; graphene light bulbs; car window films; graphene graphic cards (GPUs); hockey sticks

2019 - implanted brain sensor; graphene used in cars; graphene forklift battery

2018 - graphene used in golf balls, hiking boots; Huawei smartphone has graphene cooling; road surface using graphene

2017 - Tata Steel anti-corrosion coating; UK's Dassi Bikes makes graphene frame; in-ear monitor earphones

2016 - Huawei graphene high-temp battery; graphene motorcycle helmets

2015 - China graphene-zinc anti-corrosion primer; graphene fishing rod

2014 - IBM creates 10,000x faster chip; bicycle rim introduced

2013 - tennis racket

2012

2011 - 1st product: anti-theft packaging

2010 - Nobel prize

2009

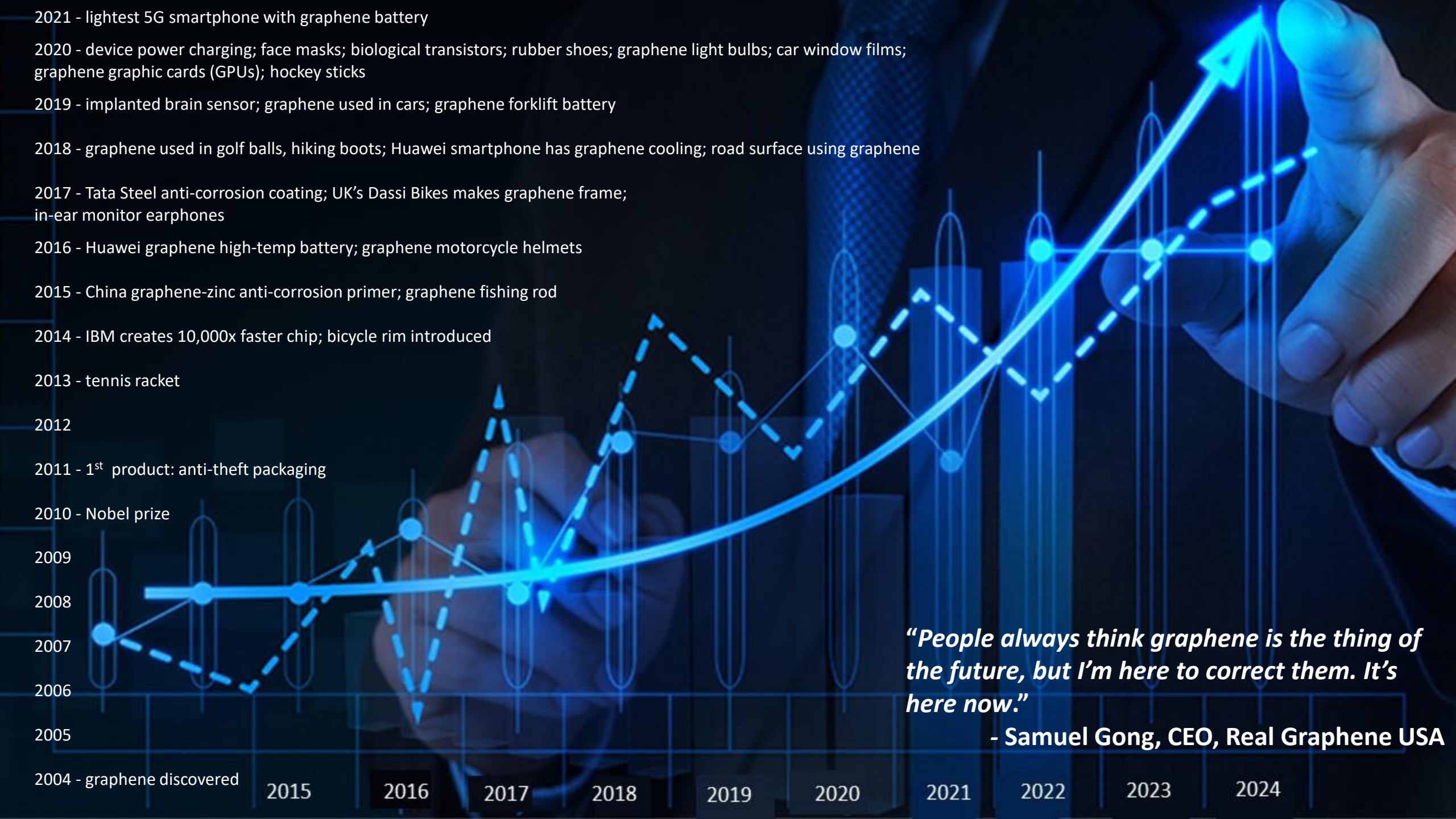
2008

2007

2006

2005

2004 - graphene discovered



"People always think graphene is the thing of the future, but I'm here to correct them. It's here now."

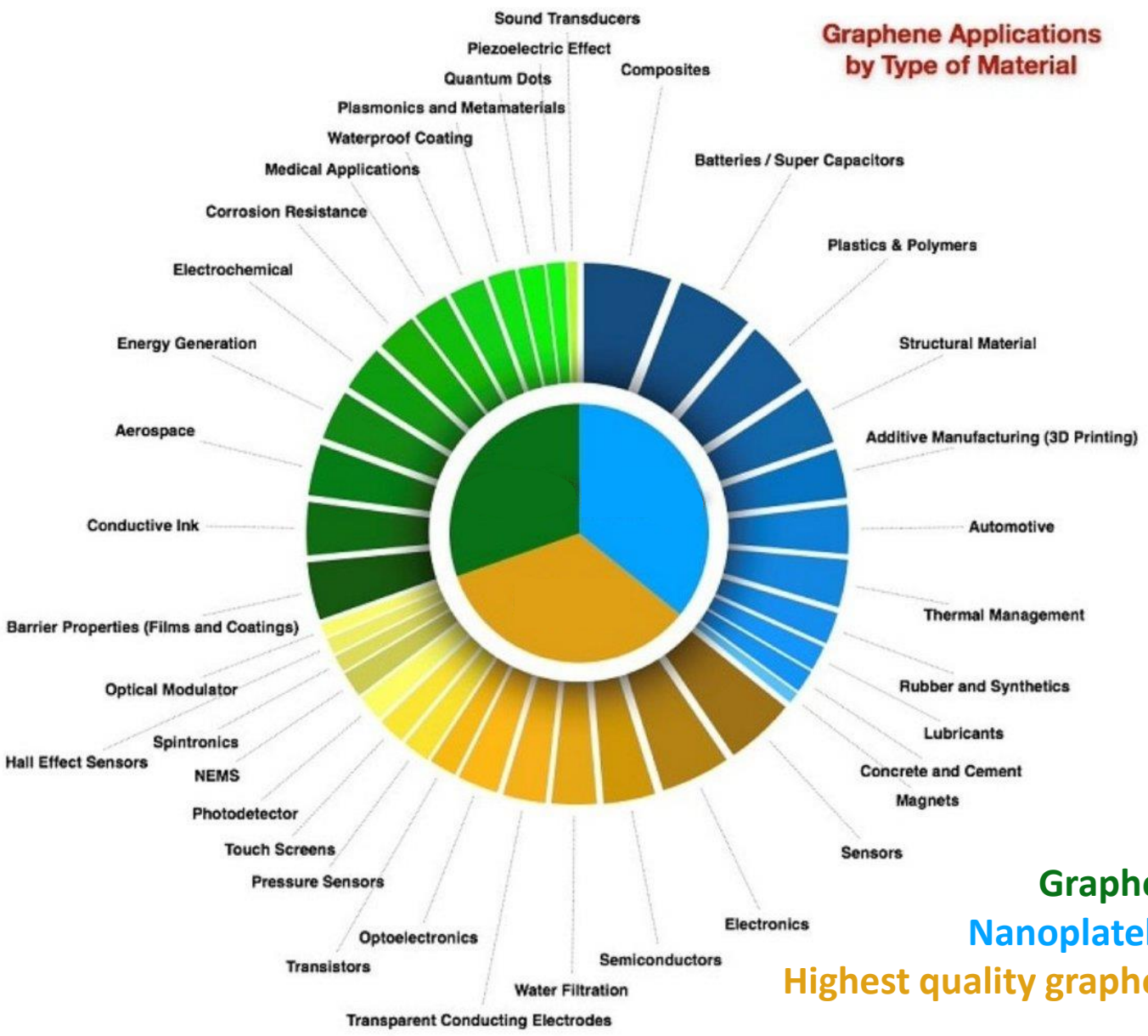
- Samuel Gong, CEO, Real Graphene USA

Some of the Sectors Poised to Use Graphene

Top uses in the physical sciences include aviation, conductive inks, electric vehicles, batteries, supercapacitors, 3D printing, electronics, environmental remediation, sensors, fuel cells, water filtration/ purification & the military (with many uses)

Top uses in the biomedical sciences include antiviral, antibacterial, tissue engineering, bioimaging, bioimplants, medical devices, drug delivery, biosensors, gene therapy & bio-micro-robotics

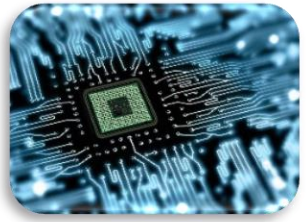
Adding 0.50% of Avadain's *graphene flakes to a supercapacitor enabled very rapid charging/discharging, 100% depth of discharge & increased power density. It also enabled constant specific capacitance as the discharge current increases, whereas other flakes have declining specific capacitance.*



There are hundreds of applications across leading growth industries that need *Avadain*'s high-quality graphene flakes, including:

Space Exploration

- Craft hulls & shielding
- Heat dissipation
- Microelectronics



Electronics

- Semiconductors & transistors
- Conductive inks
- Display screens

Aviation

- Lighter & stronger composite parts
- Lightning strike protection
- Coatings with imbedded sensors

Renewable Energy

- Solar PV films & coatings
- Wind turbine blades
- Battery storage

Electric Vehicles

- Supercapacitors
- Safer & longer lasting batteries
- 3-D printed composite parts

Medicine

- Biosensors
- Drug delivery
- 3-D bioprinting

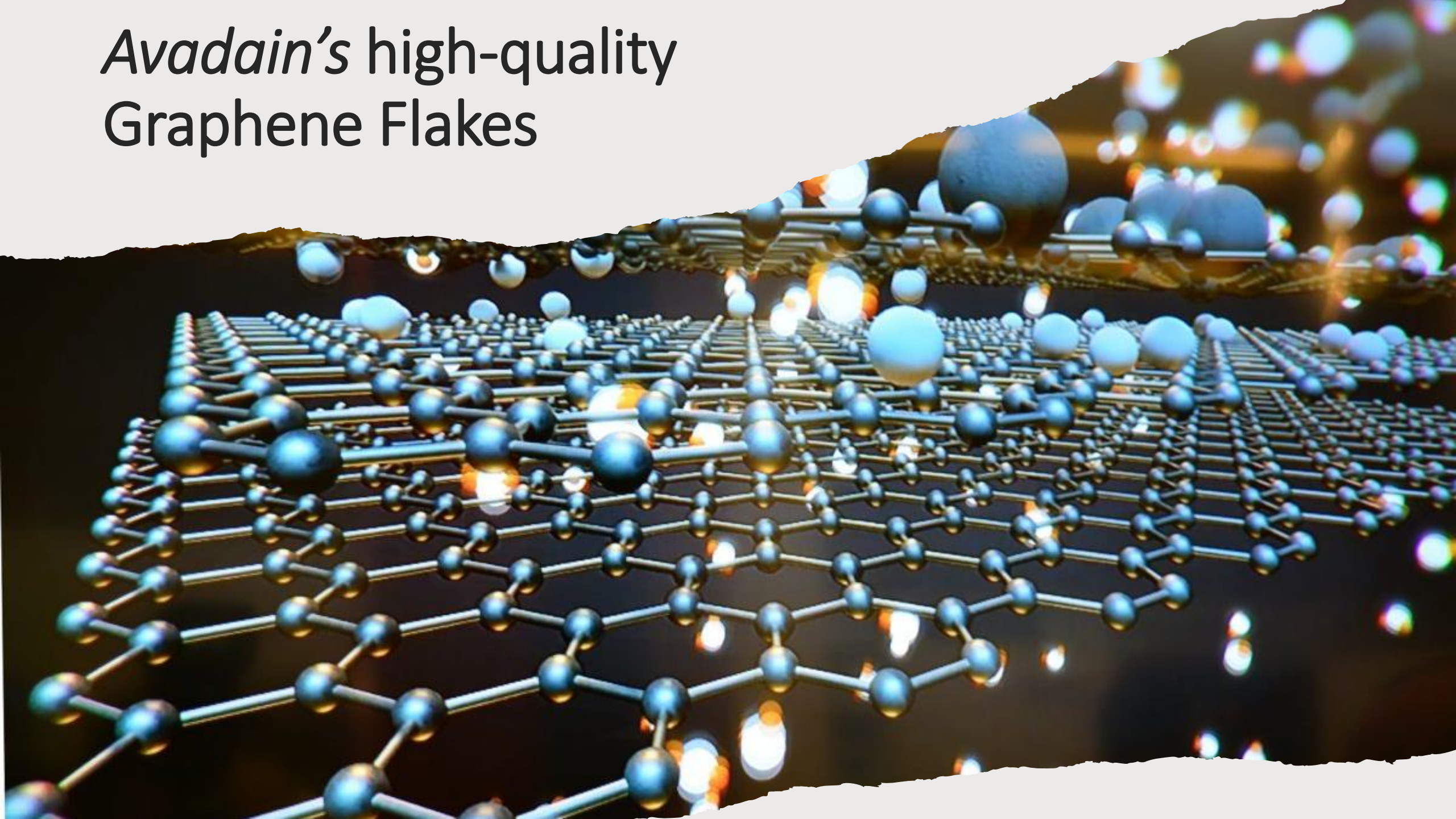
Defense

- Survivability/force protection
- Radar signature reduction
- Supersonic speed capabilities

Filtration

- Water membranes
- Air filters
- Hazardous waste processing

Avadain's high-quality Graphene Flakes



Types of Graphene

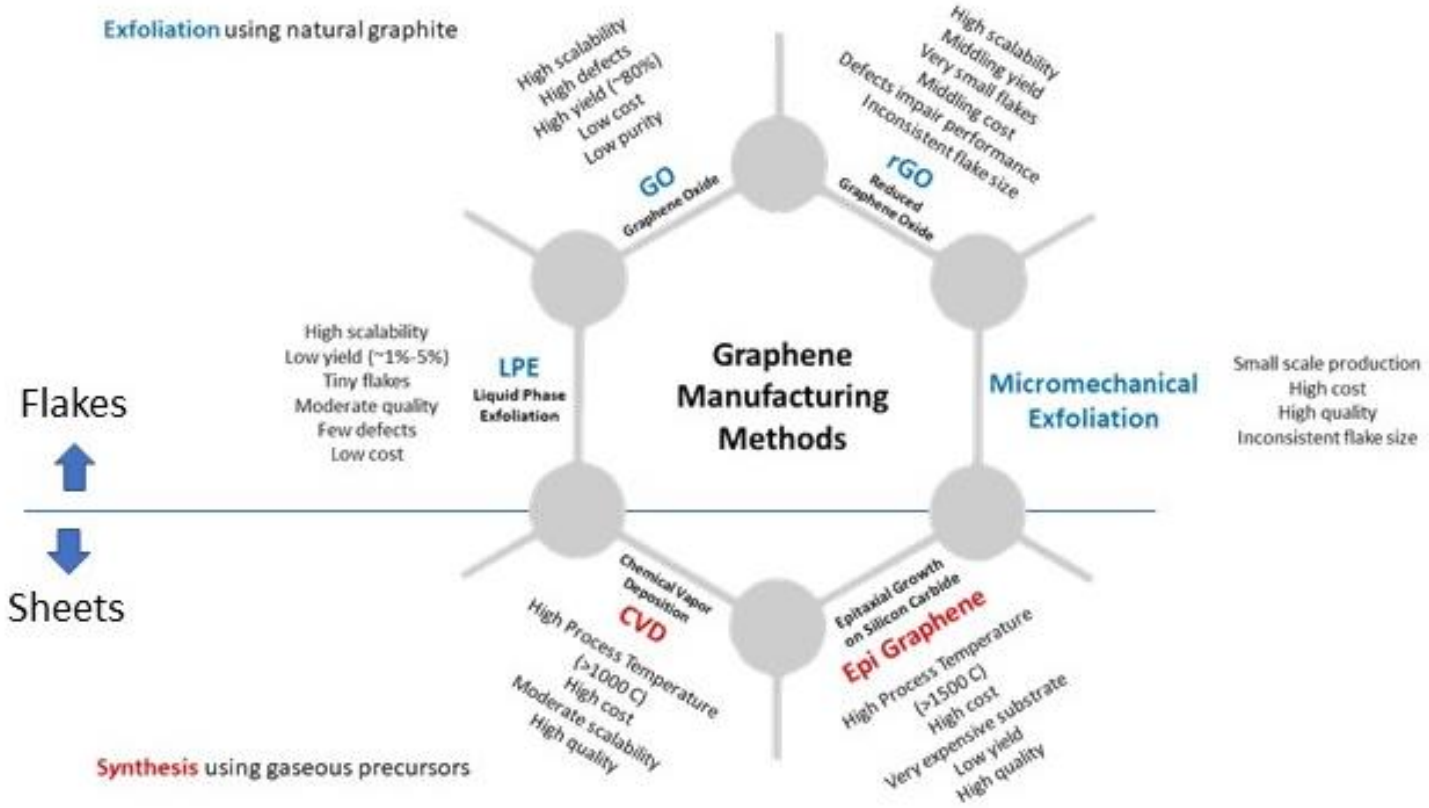
Flakes are the preferred form factor for industry & the US government. **Avadain's** *large, thin & very few defect flakes should meet the needs of >80% of market need*

"Flakes" & "sheets" are primarily used in most (but different) commercial applications

- Two relatively minor types of graphene are "ribbons" & "powders"
- Nanoplatelets lack typical properties of graphene & are not relevant to our market
- Graphene oxide & reduced graphene oxide generally have too many defects & do not possess many of graphene's unique, desirable properties

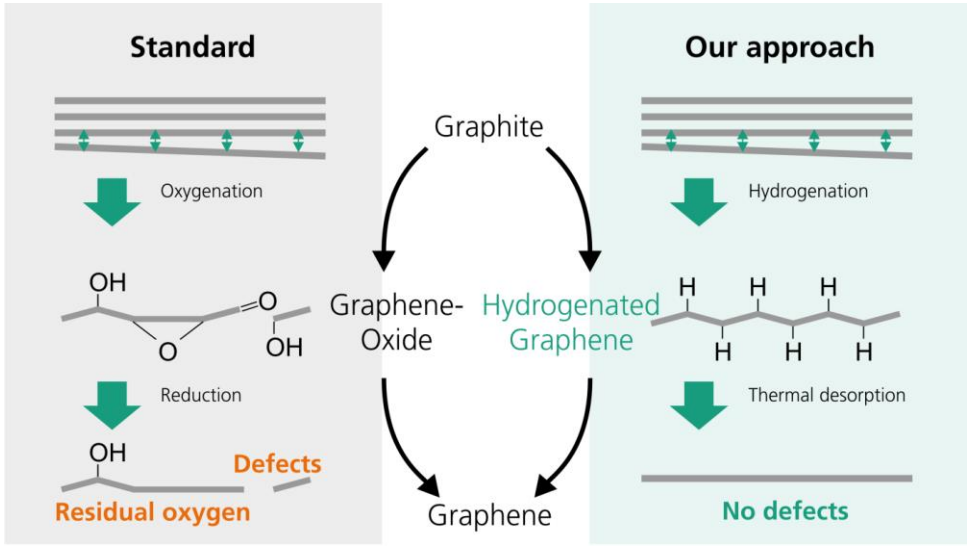
Sheets are expensive to produce, use toxic chemicals, costly substrates & hard-to-control process parameters. Separating the sheet from the substrate can damage its structure & negatively affect its properties

Flakes have an immediate market use to enhance a vast number of products & to create new products

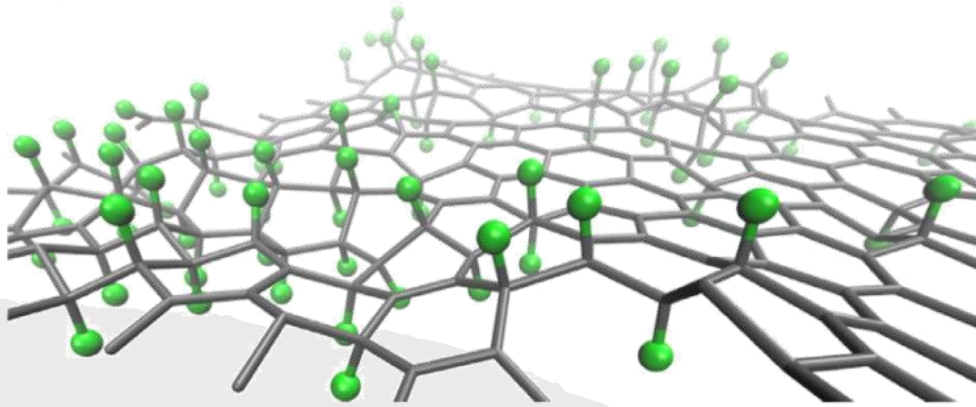


Avadain's Breakthrough, Patented Technology

Avadain's technology uses optimized Electrochemical Exfoliation & Expansion to consistently produce high-quality graphene flakes (very few defects) with a 70%+ yield using a new, green technology which we are in the process of upscaling to mass-production at acceptable cost. It was originally invented, patented & demonstrated in a supercapacitor by Fraunhofer in Germany & funded by Panasonic Corporation



Chemisorption of reducing hydrogen helps exfoliate graphite into low-defect graphene flakes with little oxidation in the graphene structure, contrasting the popular Hummer's Method using very strong oxidizing agents to exfoliate graphite into graphene oxide flakes with too many hard-to-remove defects.

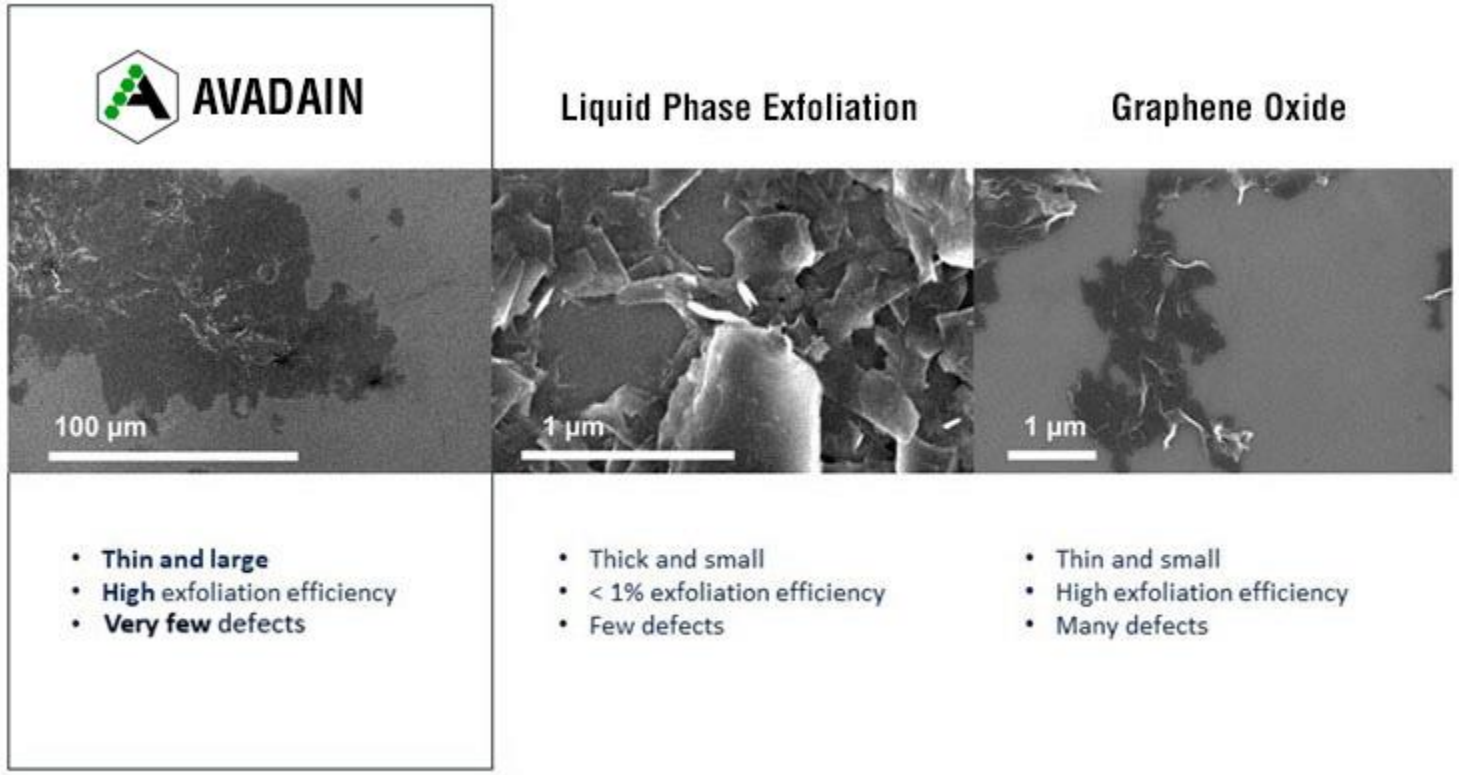


Graphene structural modification by the chemisorbed hydrogen

Avadain's Graphene Flakes Are high-quality

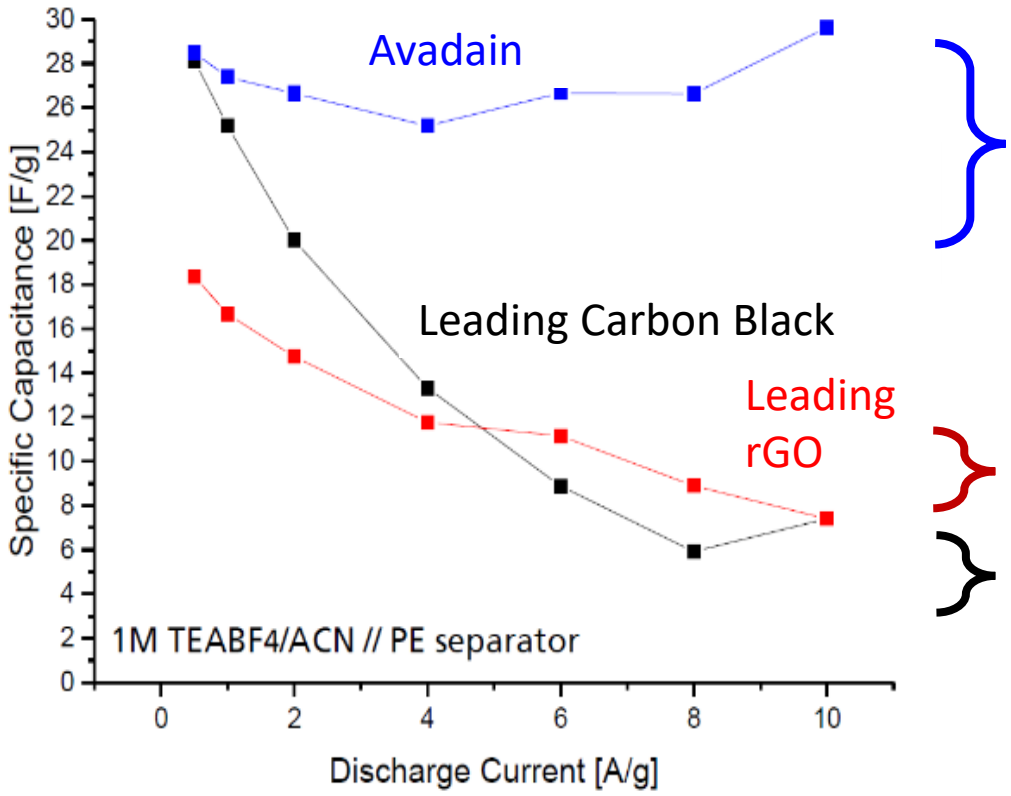
Avadain's process reliably & cost-effectively achieves:

- high-quality
- Thin (avg. 2-5 atomic layers)
- Large (avg. 55 µm^² up to ~100 µm^²)
- Nearly defect-free
- High yield (70%+)
- Affordable cost, declining as production volumes scale up



Only high-quality graphene can confer graphene's miraculous properties in many high value products

Avadain Graphene Flakes' Superior Performance In Supercapacitors



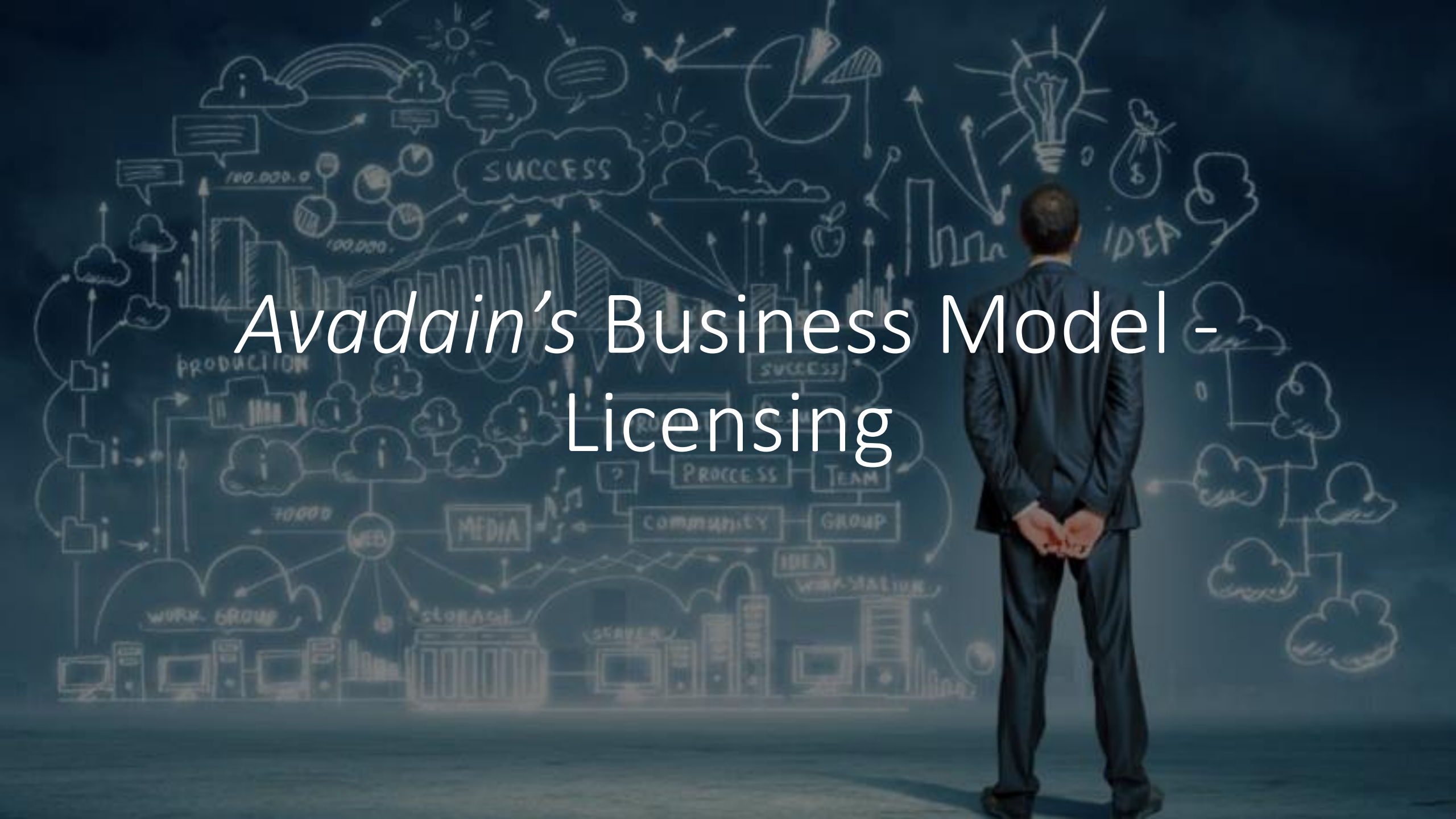
With *Avadain's* flakes, specific capacitance is constant as the discharge current increases

100% depth of discharge and excellent power density

Ideal for boosting supercapacitors for EVs, buses, trams & grid buffering

The conductive carbon black (activated carbon) & **rGO** showed rapidly declining specific capacitance

*IDTechEx projects the market for conductive material for supercapacitors to reach **$8 billion** in 2025*



Avadain's Business Model - Licensing

Licensing Model

Avadain's capital efficient licensing model could generate substantial recurring revenue. *Avadain's* model is similar to ARM Holdings' hugely successful licensing model
ARM licenses its chip designs to chipmakers. We plan to license our manufacturing technology to advanced materials companies, who will mass produce graphene flakes
Advanced materials companies have the equipment, people, expertise and – most importantly – existing customer base to quickly generate graphene sales
Through our highly experienced licensing team, *Avadain* will offer licensees manufacturing technology & know how (facilitated by an implementation team)
The licensing model enables flexible & rapid scaling to meet burgeoning market demand

Target Licensees & Commercialization Strategy

Target licensees:

- Advanced materials manufacturing companies
- Niche materials manufacturers in different industry verticals
- End users which need to assure quality & reliability of supply

Push/pull commercialization strategy supported by continual patenting

- *Push* – Licensing team markets to potential licensees, beginning with the US & expanding to allied countries over time
- *Pull* – Marketing & application support teams create demand from potential high value end users (companies which will use the flakes in their products)

Operational Plan

Current State of Our Technology

Avadain's prototyping demonstrated that our proven technology reliably produces large, thin & very few defect graphene flakes in the lab using a batch process

The next step is to upscale to a high-throughput continuous flow process for producing metric tons of high-quality graphene flakes at acceptable cost

Operational Plan Objectives

Convert batch manufacturing process to mass production (Yrs 1-2)

- Pilot scale continuous flow
- Industrial scale production line
- Develop detailed specifications & create turn-key tech transfer plan

License the technology (commencing Yr 3)

- Assisted by our marketing team, our very experienced licensing team will target a total of 2-3 licensees per year
- Dedicated technical implementation team will assist rapid set-up of Licensee's production lines

Continual innovation, patenting & application development (ongoing)

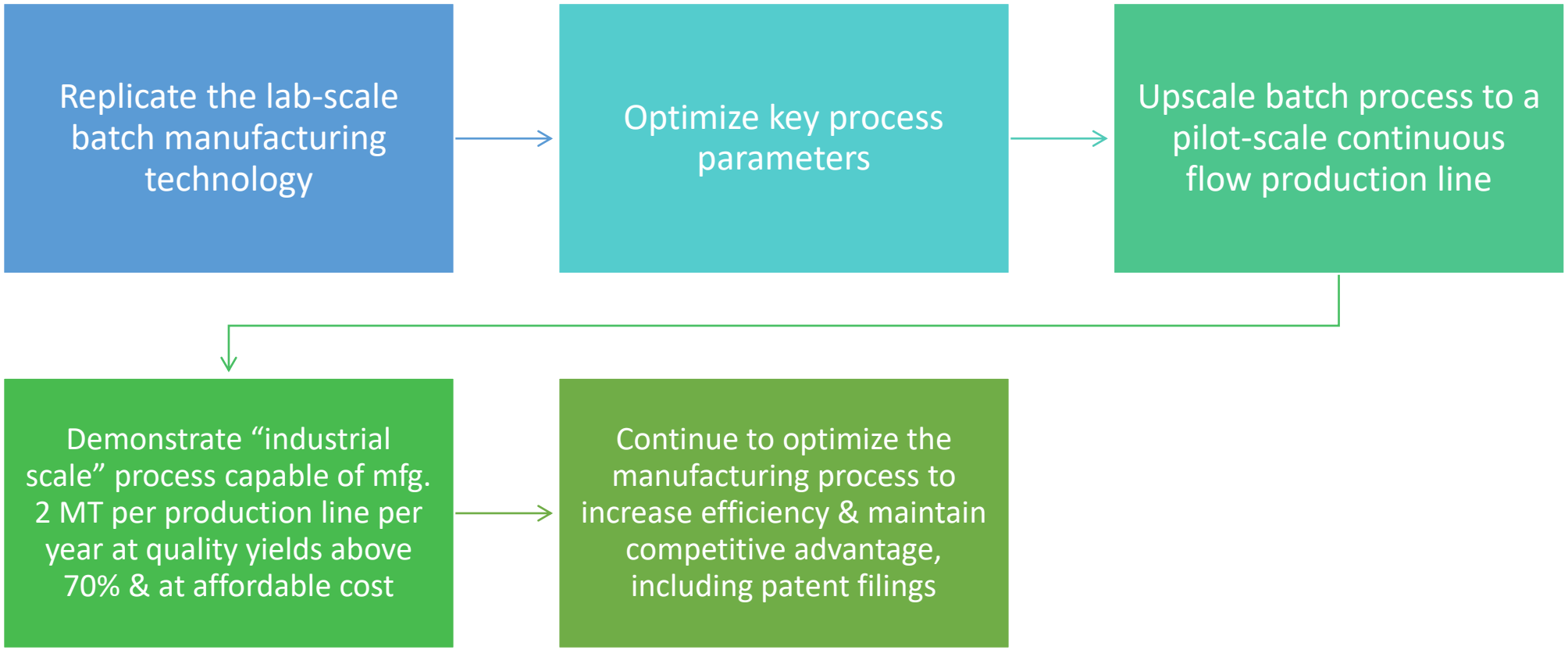
- *Avadain* is committed to ongoing patenting for continual value creation

Upscaling Manufacturing

Avadain has engaged the Rapid Advancement in Process Intensification Deployment (RAPID) Manufacturing Institute®, a part of the Manufacturing USA network, as project manager to upscale Avadain's technology & demonstrate the quality of our flakes in two high profile applications with a $3.77 million Federal project grant

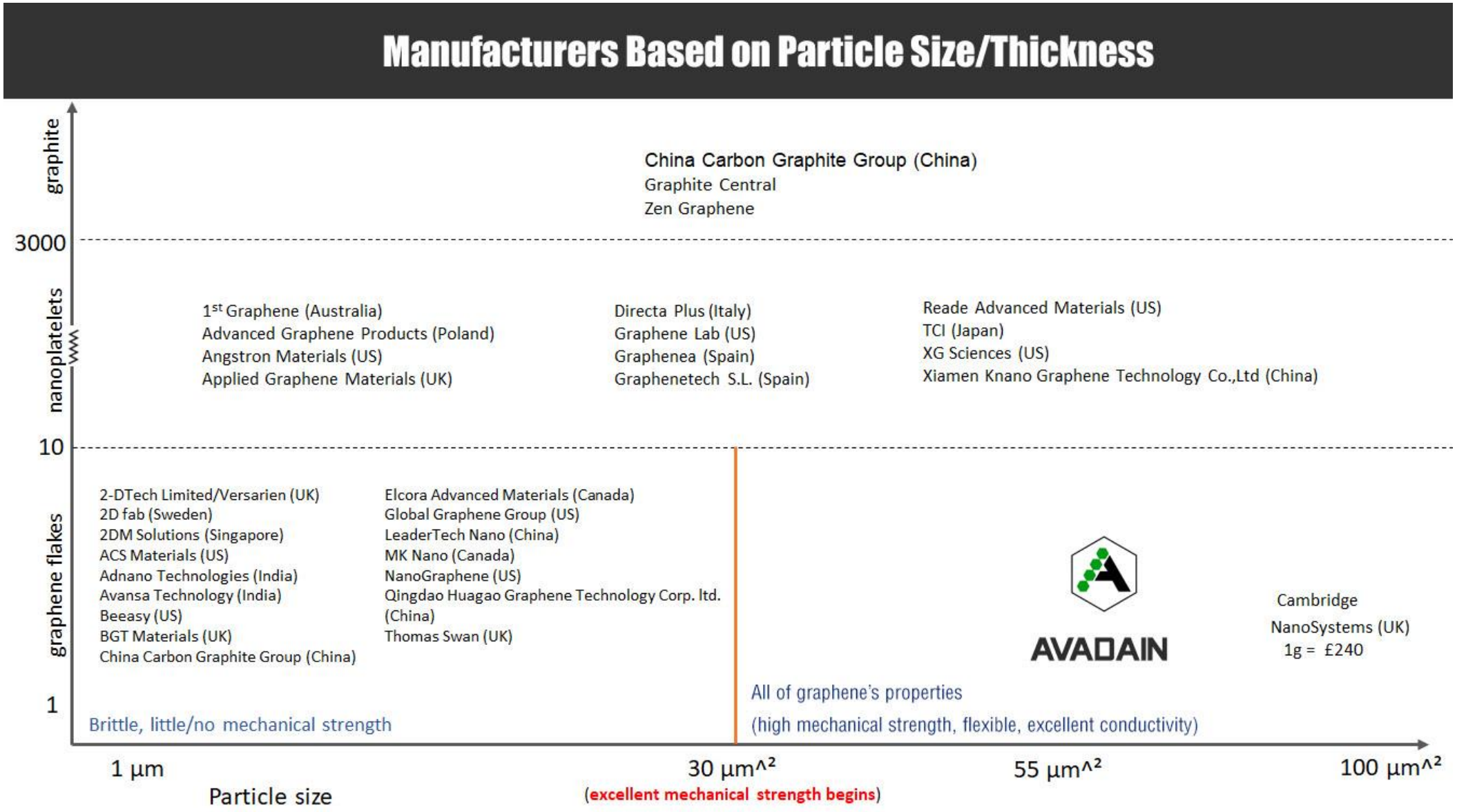
- RAPID is a public/private partnership between the US Department of Energy & the American Institute of Chemical Engineers. RAPID is focused on using advanced materials, novel manufacturing techniques & advances in process modeling to quickly & efficiently move technologies like Avadain's from pilot to production
- RAPID has a large member network, including companies *Avadain* will approach as potential licensees
- RAPID & *Avadain* have partnered with one of the US' leading research institutes to help develop industrial scale graphene flake production. Their talent, resources, deep technical heritage & outstanding lab facilities are ideally suited for upscaling Avadain's technology

Converting Batch Process to Mass Production



Competitive Landscape

Avadain Has Virtually No Competition



Chinese z10 graphene armored attack helicopter

China Dominates Global Supply Chain of Lower Quality Graphene Nanoplatelet & Graphene Oxide

China’s government has made graphene a top national priority

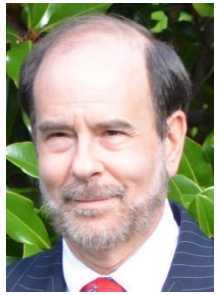
- China's 13th Five-Year Plan (2016-2020) lists graphene as a leading sector of the national economy
- *China Daily* reports that “around 3,000 Chinese companies are exploring uses for graphene, … while half of the world's graphene-related patents have been filed in China.”

According to IDTechEx Research, China accounts for 70% of graphene nanoplatelet/graphene oxide global production capacity, driven by government policy & aggressive pricing

American industry & government need a secure supply chain for high-quality graphene flakes


Leadership

Leadership Team



Brad Larschan

CEO

Brad Larschan co-founded Avadain and has been involved with the development and patenting of Avadain's technology since 2016. He has served on Avadain's Board of Directors since its inception and arranged early investment in Avadain's technology by Panasonic. Mr. Larschan has extensive experience in the development and commercialization of breakthrough technologies, including co-founding and leading Bastille LLC, which commercializes disruptive technologies created by universities and research institutions worldwide. Mr. Larschan has extensive expertise in patenting to support commercialization and enforcement of IP-based technologies. He is a member of the IAM Strategy 300: The World's Leading IP Strategists, which identifies individuals leading the development and implementation of strategies that maximize the value of IP portfolios. Mr. Larschan has held leadership roles in a number of start-up and early-stage companies since 1993. Before that, he was an international lawyer in Washington, DC. Mr. Larschan has a BS (magna cum laude) in journalism and politics from Boston University and JD (cum laude) from Boston College Law School.

Ericka Wojack

COO/CFO

Ericka Wojack co-founded Avadain and has served on its Board of Directors since its inception. She is responsible for overseeing the financial and operational activities of Avadain. Ms. Wojack has extensive experience managing growth and the cash position of start-up and early-stage companies. She has spent 27 years in early-stage and start-up companies, the last 17 of which were with IP licensing ventures. Ms. Wojack has a BBA (Finance) from the University of Wisconsin at Madison and an EMBA (summa cum laude) from the University of Memphis. She is a member of the Institute of Management Accountants, where she is a Certified Management Accountant and Certified in Financial Management.

Phil Van Wormer

CCO

Phil Van Wormer is a co-founder of Avadain and responsible for its manufacturing scale-up and marketing. He has over 40 years of experience leading the development and global commercialization of over 50 new technologies, products and services including advanced membranes, films, polymers and aerospace composites, sustainable micro grids, super capacitors and ultra-efficient electric vehicles. Mr. Van Wormer has held senior executive positions at Fortune 500 companies, including DuPont and GE, as well as CEO and Chief Commercial Officer roles for early-stage private equity and venture capital backed technology companies. His manufacturing experience includes leading the turnaround of a $100 million polymer manufacturing operation in Texas and the start-up of a new film manufacturing facility in Japan. During his career, he has also been involved in a number of entrepreneurial endeavors, including wireless spectrum development and off-grid solar systems. Mr. Van Wormer holds a Chemical Engineering degree from Tufts University.

Ryan Tian

CSO

Dr. Z. Ryan Tian has a rare mix of academic achievement, entrepreneurial spirit and industry experience. In addition to being Avadain's Chief Science Officer, he is an associate professor at the University of Arkansas (UArk), where his lab primarily focuses on developing new nanotechnologies all viable to large-scale industrial manufacturing. In 2000-2001, Dr. Tian managed an R&D team and three production lines' 24/7 operations (~200 people) at AXT (Fremont, CA, the USA #1 III-V semiconductor manufacturer). While at AXT, Dr. Tian created a new engineering route to boost productivity of a production line by 50%, controlled QA/QC of products out of raw materials ($5MM/day), and managed compliance with California OSHA regulationsDr. Tian joined the faculty of UARK in 2004, where he co-founded the Journal of Nanotechnology for Engineering & Medicine, the American Society for Nanomedicine, and the Arkansas Institute for Nanoscience/Engineering. Dr. Tian earned his Ph.D. (1998, major in Inorganic Chemistry and minor in Chemical Engineering and Materials Science) from the University of Connecticut. He did his postdoc at the University of California-Davis (1998-2000) and Sadia National Labs (2002-2004).

Avadain's Patent Position

FISH & RICHARDSON

- Strong IP position is core to *Avadain's* value creation
- The US' #1 IP law firm, Fish & Richardson, drafted & filed a comprehensive patent application in 2016
- Parent patent granted in the US (#10,662,537), Brazil, Brazil (divisional), China, Europe, Germany, India, Israel, Japan, Russia, Russia (divisional) & Singapore
- Patents pending in Australia, Canada, Chile, China, Indonesia, Israel (divisional), Japan (divisional), Korea, Malaysia, Mexico, Singapore (divisional), US (continuation) & Vietnam
- The second patent was filed in 2019 in the US (#16/569,264), followed by a PCT in September 2020

"Continued innovation is the best way to beat the competition."

- Thomas Edison

Continual Innovation

- *Avadain* recognizes that the long-term competitive advantage of its technology licensing requires ongoing innovation & optimization of its graphene flake manufacturing technology
- We anticipate that the development of continuous flow of graphene flakes will support ~10 additional patent applications over the next four years, and additional patents beyond that

Summary

- ✓Breakthrough technology
- ✓Environmentally friendly
- ✓Patented globally
- ✓Capital-light licensing model
- ✓Huge, global market opportunity
- ✓Pent-up demand
- ✓Great team/complementary skills
- ✓Successful proof of concept
- ✓Proven in supercapacitors
- ✓Few/no competitors

Just as plastics was *the* material of the 20th Century, we believe graphene is about to become *the* material of our Century. Graphene-enabled products will likely be measured in the hundreds of billions of dollars

Avadain has a globally patented, breakthrough technology that produces graphene flakes meeting >80% of the high-quality flake needs of private industry & the US government

We seek up to $5 million to upscale our technology, continue patenting & begin licensing industrial-scale production of high-quality graphene flakes

The market is waiting for tons of large, thin, nearly defect-free graphene flakes in industrial quantities at reasonable cost. Avadain is poised to ride the graphene megatrend

For more information, please contact:

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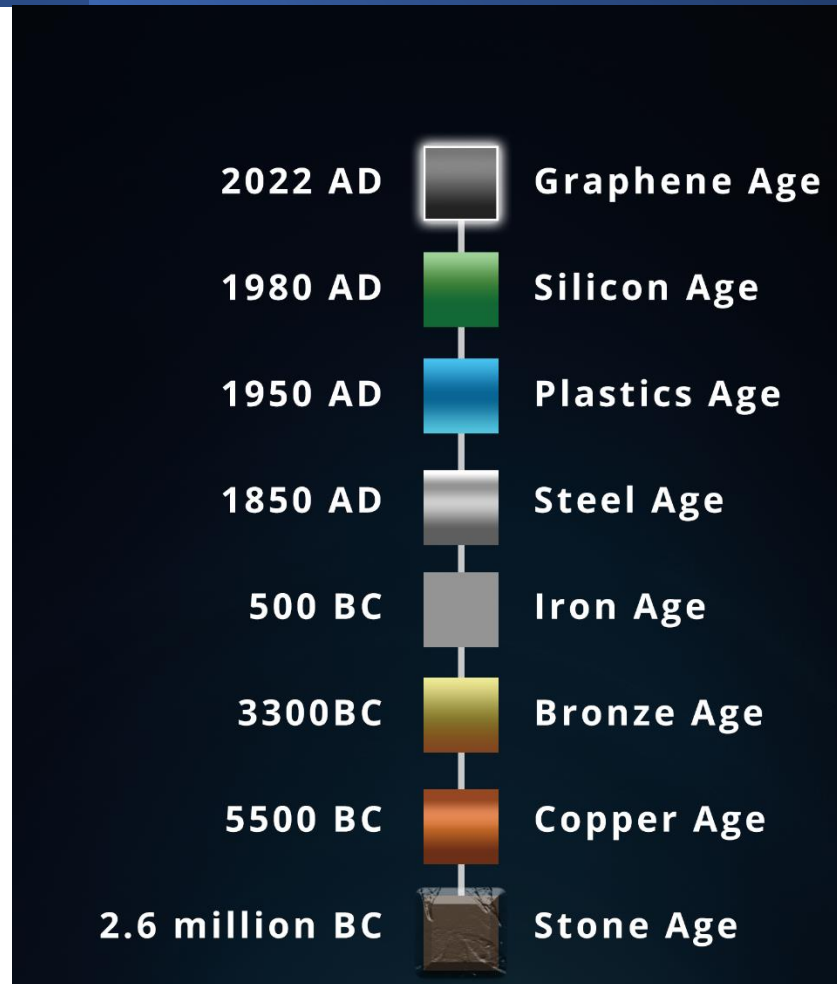
AVADAIN



Unleashing the Graphene Revolution©