

Unlocking the industrial potential of Graphene

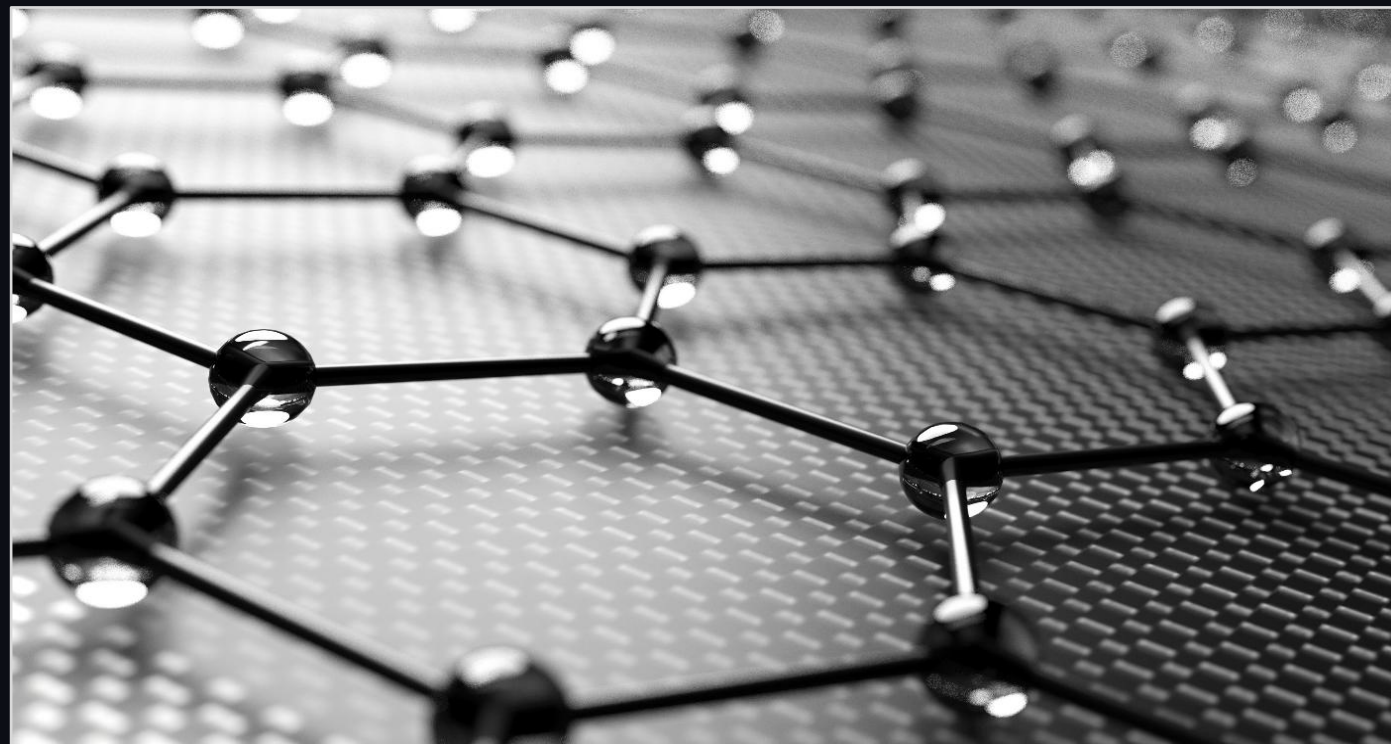
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Graphene is a super material with unique properties, suitable for a range of industrial uses

Graphene, first isolated and characterized in 2004, is a material extracted from graphite. It is made up of pure carbon atoms bonded together in a hexagonal sheet-like structure.

Each sheet is one atom thick.



Graphene's unique properties:

Strong

Graphene is the world's strongest material - 200x stronger than steel

Light-weight

1000x lighter than a piece of thermal paper, 5x lighter than aluminium

High conductivity

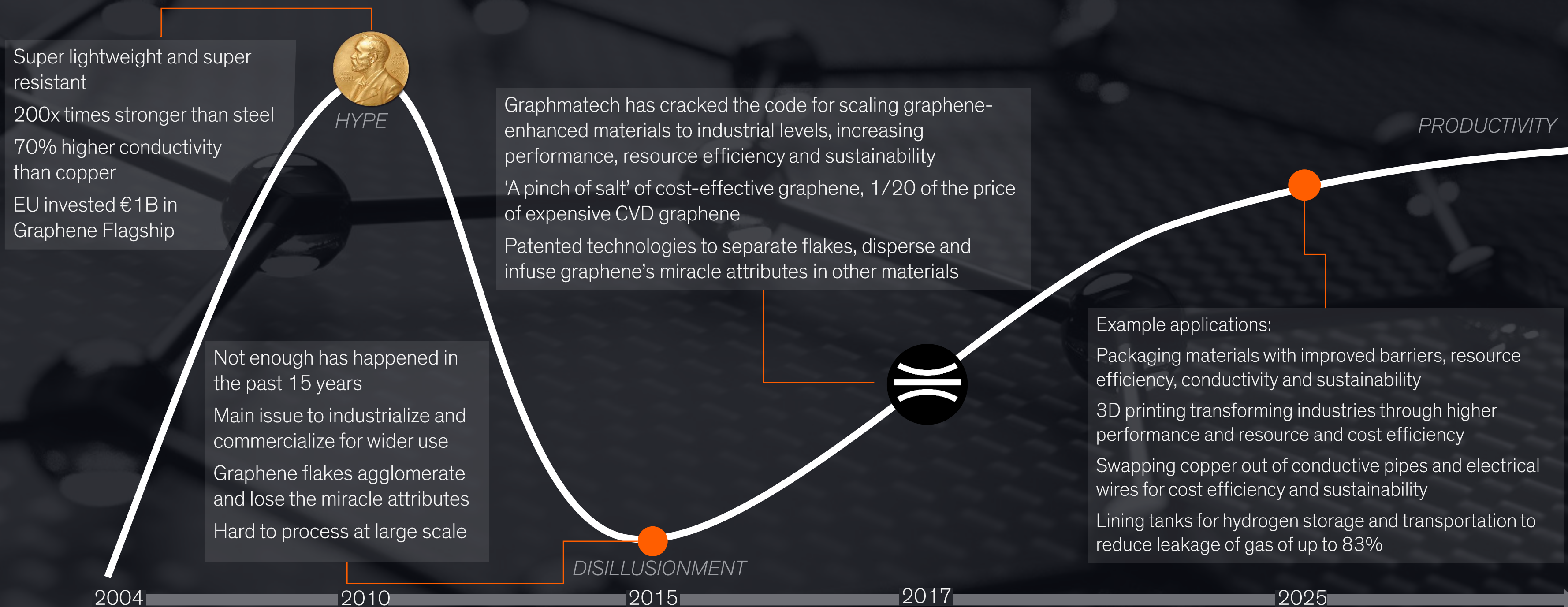
Exhibits a conductivity of $\sim 4000 \text{ Wm}^{-1}\text{K}^{-1}$ - 70% higher than copper

Abundant

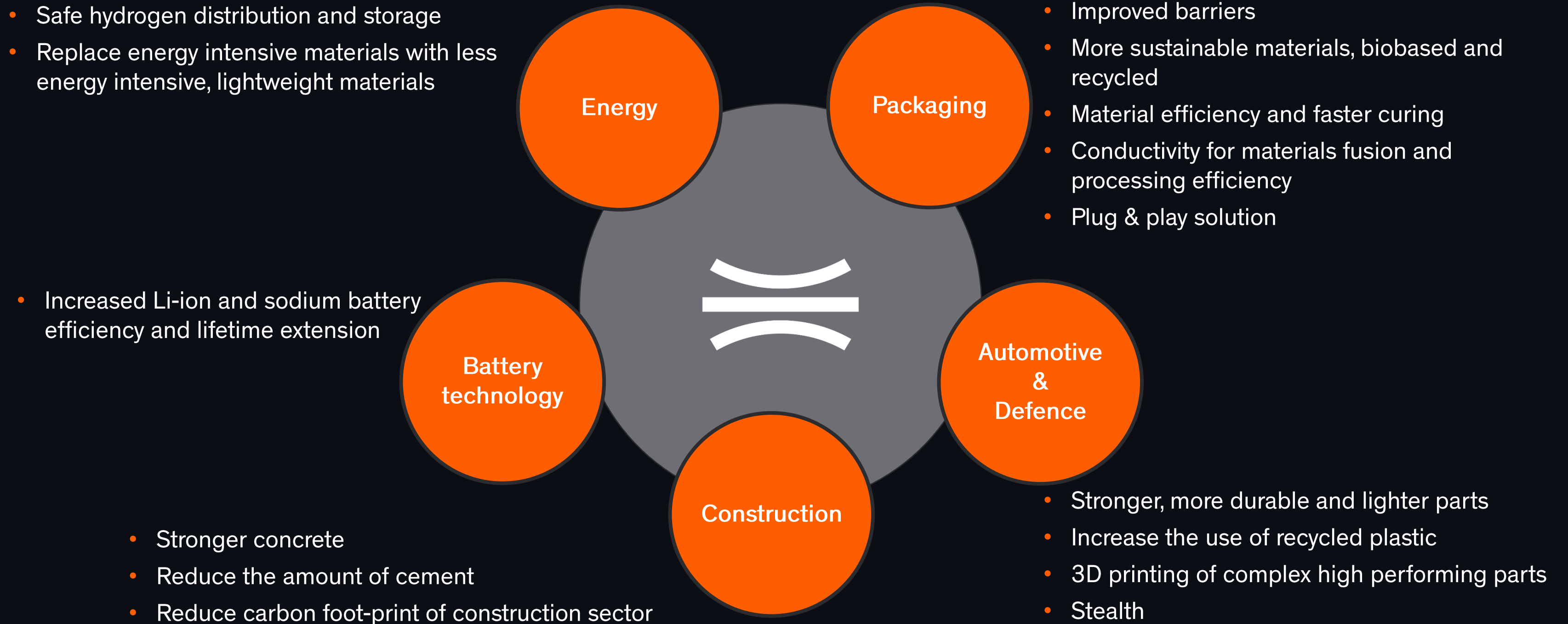
Can be produced from various raw materials, including graphite, methane cracking, and waste recycling



Graphmatech brings graphene from research material to industry-scale productivity



The potential market for graphene-enabled products spans **almost every industrial sector**



Graphmatech at a glance

Graphmatech is a leading deep-tech startup unlocking the industrial potential of graphene-enhanced advanced materials



Graphmatech today

8+

Years of research

16

People in the team, with deep experience in material science, industries and scale-ups

5

Patent clusters in a continuously advancing technology platform

5

Key investors already invested: 0.8 MEUR pre-seed, 8 MEUR Seed, 4 MEUR bridge



Graphmatech development objectives

5 → > 200 tons

Increase from current annual production capacity of 5 tons to 100 tons by end of 2025

3 regions

Established commercial and production operations by end of 2026: EMEA, Asia and North America

Graphmatech application areas (examples)



Additive manufacturing / 3D printing



Conductive polymers



Industrial packaging



Hydrogen storage and transportation



Confidential

Strategically building a technology platform with speed, spin-out opportunities and rapid ramp-up of production capacity

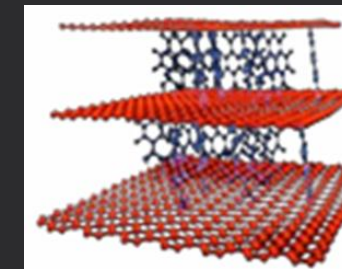
World-leading innovation speed...

- Faster advanced material development than market standard
- Accelerated by machine learning bringing new materials in months and not years
- Strategically crafted and continuously evolving IP portfolio designed for selected application areas and seamless spin-out opportunities

...a strategic patent structure...

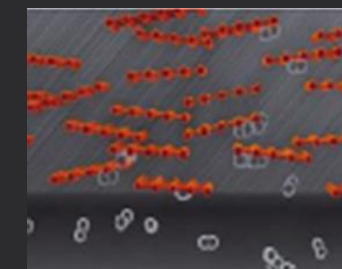
Aros Graphene

Functionalizing graphene for different needs



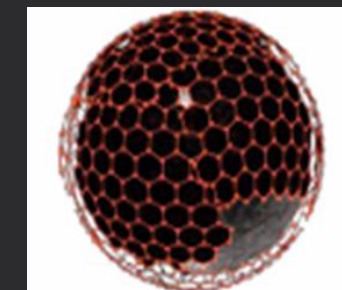
Aros Hydrogen

For hydrogen infrastructure materials



Aros Coat

Coat particles with graphene



...with rapid manufacturing scaling globally



Modular manufacturing



A fully equipped laboratory and production facility to produce at pilot scale

- Production and R&D laboratory divided on 900 sqm in Uppsala Sweden.
- Installed and commissioned pilot production lines with yearly combined capacity of 12 ton
- Modern facility with tailor made installations to suite Graphmatechs business needs
 - ESD flooring
 - Upgraded electricity
 - Process water, ventilation and pressurized air

Production facility



- Facility to thrive and scale in

Laboratory



- Analysis equipment inhouse

Extrusion Pilot Line



- Yearly capacity 2 ton 1 shift
- Confirmed Next scale 50-70 t/y, 1 shift.
- Installed and commissioned nov 25

Metal coating pilot line



- Yearly capacity of 10 ton 1shift
- Tailor made process design. Graphmatechs Standard machine concept

3D filament printers



- 3D Printers and filament maker for quality control and development of 3D filaments

Graphmatech's graphene enhancing technology

Polymer graphene

Formulation of polymers either by coating particles or mixing the materials

Bulk manufacturing

Conductive polymers

Polymers for hydrogen

Additive manufacturing

3D filament

3D powder

Metal graphene

Coating particles of different metals, e.g., Co, Li, Al, etc to provide them with graphene properties

Powder Metallurgy

Extrusion

Hot Isostatic Pressing (HIPing)

Plasma Coating

3D printing





Graphmatech has developed a portfolio of ready-to-commercialize products



Polymers for 3D printing



20-120% faster printing

- Excellent ESD properties
- No clogging or stringing



Polymers for conductivity



40% cheaper

- Excellent ESD protection
- Approved ESD safe
- Replacing copper



Polymers for packaging



20-40% cheaper

- Simplified manufacturing, less layers
- Increased barrier properties
- Recyclable material



Polymers for hydrogen



80% less leakage

- Improved mechanical properties and blow moldability



Polymers for stealth

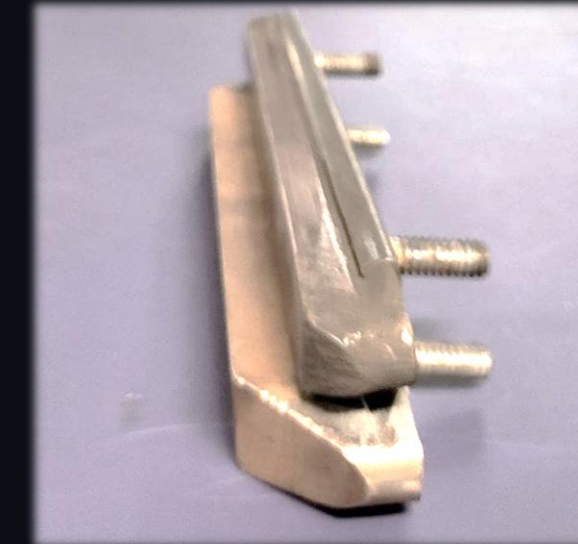


8x permittivity

- Up to 8x higher imaginary permittivity
- 3D printing, coating and molding



Metal coating for durability



70% lower friction

- Self-lubricating
- Wear resistance
- Longer lifetime


Machine-agnostic

Drop-in materials

New and retro-fit

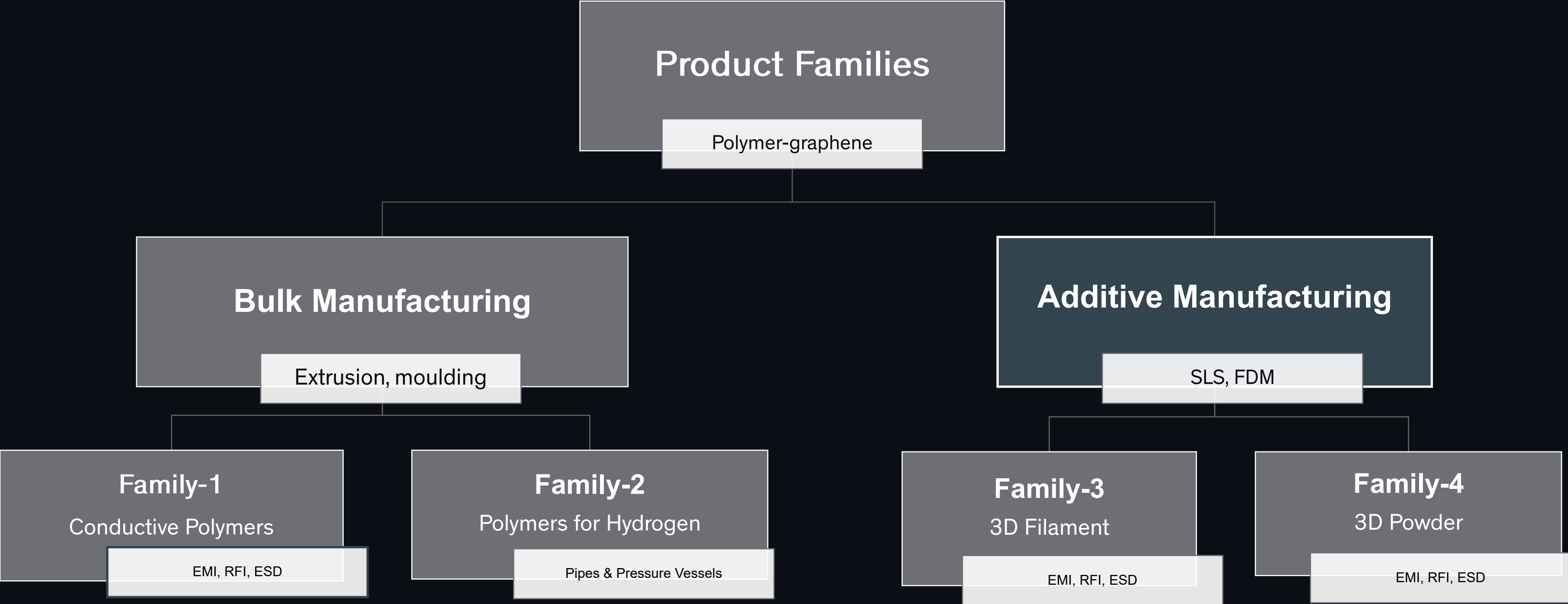


Strictly confidential



Polymer-graphene Composites

Combining graphene with polymers creates new families of materials that possess unique properties for sustainable applications.



Graphmatech's technology is enabling deployment of the **hydrogen technology**

Value proposition

Two grades suitable for large-scale industrial processes: Extrusion (EX) and moulding (IM)

Reduce hydrogen leakage by up to 67% for HDPE and by 83 % for PA polymer

Integrated ESD property for enhanced safety (important for pipes)

Combining ESD with lower hydrogen permeation provides an advantage for pipes

Properties intact after further industrial processes (extrusion/moulding)

Makes HDPE materials suitable for hydrogen applications, competing with PA polymers which are 5-10 times more expensive than HDPE

End customers (e.g., utilities) benefit from:

- Cost savings through reduced hydrogen leakage (2-15% of leakage, hydrogen prices/kg vary by location)
- Lower environmental impact (hydrogen leakage is 6-11 times worse in GHGE than CO₂)
- Enhanced safety (integrated ESD)

For Polymers manufacturers (SABIC, DOW, Indian Oil, etc)

- Offer innovative complementary products for the hydrogen economy
- Strengthening their offerings in emerging markets
- Offer high-end products, not just commodity products





Use case example: Polymer-graphene material for hydrogen to reduce leakage

Background

There is a huge demand for materials that are compatible with hydrogen storage and transport. Type IV Composite Pressure Vessels (CPV's) are replacing type III CPV's due to their reduced weight and lower production costs. Metal piping is replaced or relined with polymer, saving weight and cost.

Problem to solve

Increasing requirements on hydrogen leakage and extension of operating temperatures (+ 85 down to – 60°C), while keeping mechanical properties especially at very low temperatures

Commercial potential

Addressable market is 1,300 MUS\$

Benefits of polymer-graphene material for hydrogen



80% reduction of hydrogen leakage

Reduced hydrogen leakage of type IV CPV and pipes by up to 80%



Cut costs by reducing weight

Reduced weight by enabling thinner constructions



Improved mechanical strength

Increased safety margins and lower cost



Improves processability

Stabilizes material during production by blow moulding



“XXX Composites is very interested in evaluating Graphmatech’s Polymer-graphene master batch for liners in type IV CPV’s developed for its customers.”

– XXX, Managing Director XXX Composites, Engineering company, expert in composites and winding with over 30 years experience from composite industry



Use case example : pipe company making conductive pipes with graphene

Background

Human lives and billions of dollars in property damage are lost every year, mainly due to electrostatic charge¹. Due to this, Electrostatic Discharge (ESD) materials are carefully regulated²

Problem to solve

A North American pipe company making polymer pipes to transport fish food. Solutions with metals are costly and may limit recyclability . Other additives like carbon black do not reach sufficient ESD protection

Commercial potential

Customer has signed off-take agreement of 2-3 tons/month

Benefits of a pipe made with Graphmatech's polymer-graphene



Excellent ESD protection at low inclusion

Approved according to ESD S.541 and ESD STM 11.11



Recyclable product

Avoid metal introduction to product



Easily processable by coextrusion

One step production as compared to two steps (metal)



Cheaper

40% cheaper than copper winded pipes



Lighter

30% less added weight than Cu wire

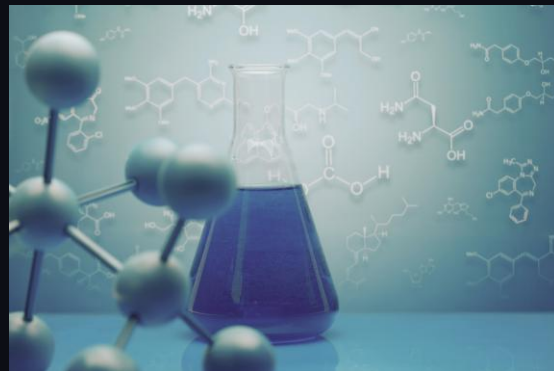


"There are extensive market applications for Polyethylene-Graphene pipe systems in North America. We are confident that the partnership with Graphmatech will soon produce the next generation of market-leading pipe solutions," says General Manager – Company X

Polymer-Graphene at Graphmatech

“One-Stop-Shop”

Formulation



Expertise in formulating various polymers with graphene (e.g., PE, PA, TPU, PVDF, ABS, PC, ASA, PP).

Industrial Processing



Extrusion, injection molding, blow-molding, rotational molding
Cooperation with machine manufactures and sub-contractors

Products offering



Masterbatches & Compounds

Technology Partner Application Development



Some industrial leaders choose to work with us.
Joint-development roadmaps
Developing markets for polymer materials

Characterization & Testing



According to industrial standards
Raman, SEM, 4-probe, hot-disc, MFR, mechanical, tribological
hydrogen permeation

Graphmatech team has deep experience in materials science, deep/green tech and large-scale industries

Management team



Olivia Nestius
CEO

On a mission to make the green transition a success, with an extensive background in clean tech at Svea Solar - one of Europe's fastest-growing cleantech scaleups - and 6 years of strategy consulting at McKinsey and Company



Dr. Mamoun Taher
Founder & CTO

Previously from ABB Corporate Research and having worked as a materials researcher at Uppsala University, Dr. Taher invented Aros Graphene and founded Graphmatech in 2017



Ted Karlsson
CFO

25 years of experience from the capital markets and investment banking industry and in recent years from scale-up & tech driven industrial companies such as Svea Solar



Dr. Cecilia Århammar
R&D Manager

PhD from the Royal Institute of Technology in Stockholm, Cecilia has over 10 years experience within materials research and development in startup and global companies



Michael Sköld
Production Manager

Previously from Sandvik, Scania and Cytiva with 10 years experience within materials manufacturing and technical project management



Alexis Montoya
Commercial Manager

Strategic and technical sales professional with over 25 years of experience in Industrial, Telecom and Defence segments. Previously from Microchip and Future Electronics

Board of Directors



Dr. Jane Walerud
Chair of the board

Serial deep tech entrepreneur. One of Sweden's top business angels since 2002. First investor in Klarna (Unicorn, BUSD)



Claudio Jordan
Board member

Principal ABB Technology Ventures/Robotics 10+ years in business strategy and deep-tech investments



Peter Gossas
Board member

Former president Sandvik Materials Technology. 43+ years of international business leadership



Pasi Kangas
Board member

VP Technology Sandvik Additive Manufacturing 25+ years in materials technology



Morgan Sadarangani
Board member

Former CFO of Tethys Oil from 2004-2017. Extensive experience in inve[INVESTOR] and raising equity and debt capital



Lisa Åberg
Senior Advisor

Former senior partner at McKinsey & Company focusing on industrial sector and the green transition

Experience from pioneering global corporations



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