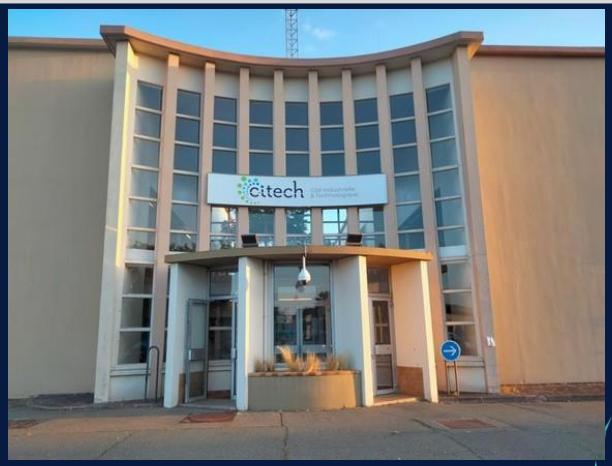
Company Presentation

21/03/2025

Introduction

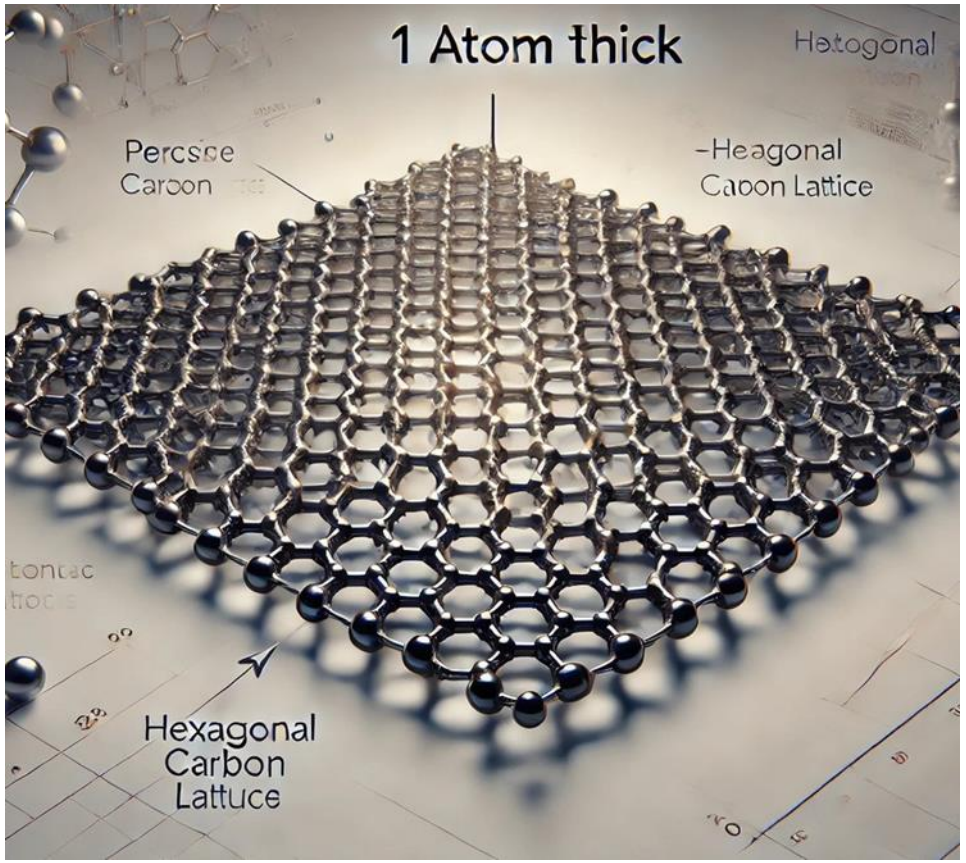


Company Overview

Graphnova is the premier graphene company based in Chartres, France just outside Paris. Graphnova is a spin out from CITECH which is a company specializing in producing lamps for the automotive industry.
Graphnova has been set up to provide access to patented technology for the manufacture of graphene nano-platelets.

Graphnova has an experienced team of scientists and engineers with many years of exposure to the graphene sector with many established projects and commercial partners in a variety of different industries.

Graphene – The Wonder Material



Graphene has been quoted as the most promising material to be discovered in this century, opening up new possibilities by being the first 2d material, in its purest form it is one layer thick Carbon atoms, although most commercial applications are a few layers thick.

Its atoms are tightly held in a hexagonal pattern creating a structure which is 200 times stronger than steel in theory, with excellent thermal and electrical conductivity.

Isolated in 2005 at the University of Manchester, it is now being commercially produced and is one of over 2000 materials that could also be manufactured at an atomic level.

Graphene Fundamentals

Increased Strength

Graphene can ability to increase strength by up to 50% with small additions to traditional materials

Tensile stress :130 Gpa

Young's modulus : 0,95 to 1,1 Tpa

Flexibility (can stretch up to 25% of original length)

Superior Electrical Conductivity

Graphene in its purest form offers the best electrical conductivity being made up of a single layer of carbon atoms.

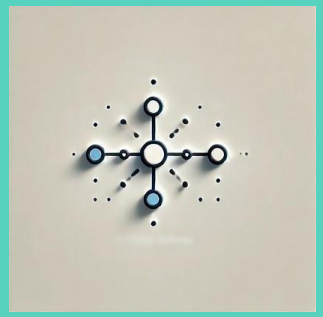
It enables sensors, wiring and increased battery performance.

(electrical resistivity 0,2 10-6 Ω.cm)

Increased Thermal Conductivity

Graphene has the ability to transfer heat in the same way it does for electricity enabling better performing clothing and devices.

Enhancing Thermal conductivity (approx. 4000 Wm-1 K-1



Secondary Advantages

As well as the top three advantages there are a number of additional benefits including EMI shielding, antibacterial properties and water filtration

High surface area /lightness (2,630 m2/g)

Thinness (single layer 0,345 nm)

Impermeability , transparent when single layer, flame resistance

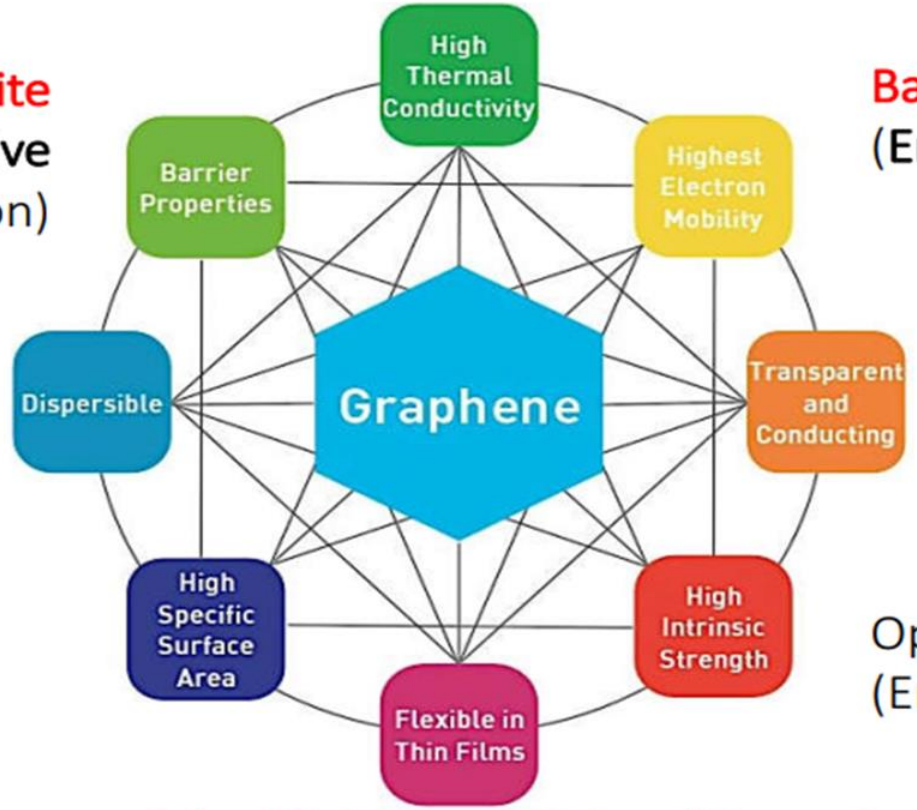
GRAPHENE – THE ULTIMATE ADDITIVE

Faster, lighter and more conductive

Concrete, Aero & Construction Materials

Coating & **Composite** (Aerospace, **Automotive** & Construction)

Batteries, Fuel cells & Inks (**Energy storage**)



Lubricant, Automotive Oil, Gas, & Marine

Optoelectronics, **Sensors** (Energy harvesting)

Inks, RF Antenna, Printed batteries

Graphene in concrete

Increased Compressive strength recorded up to 40%

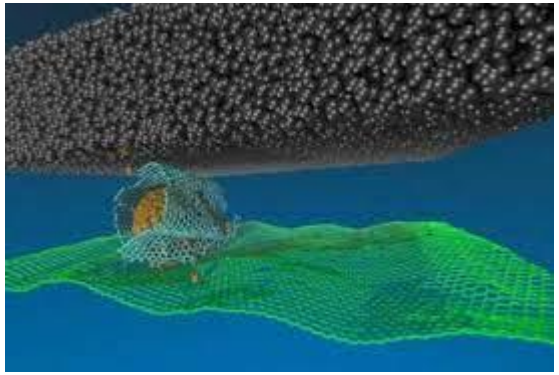
Reduced water permeability by up to 400%

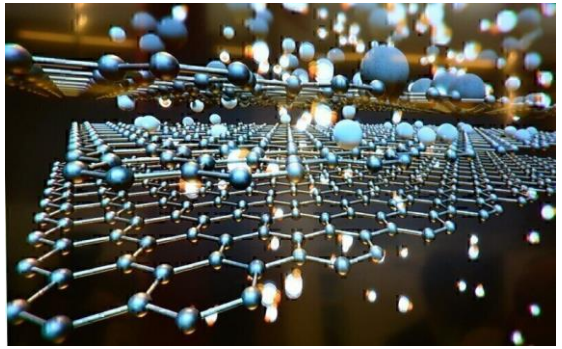
Reduced chloride migration by up to 50%

Flowability, corrosion protection of steel and increased flexural strength

Vision: energy savings and life-time increase (less friction, enhanced longevity, shield against corrosion)

Graphene in Lubricants and Anti-Friction Additives





Graphene helps by decreasing friction between moving parts at the boundary layer.

Graphene has also been seen to prevent wear lifetime fill-wear scars of an engine

With graphene, we reduce energy consumption

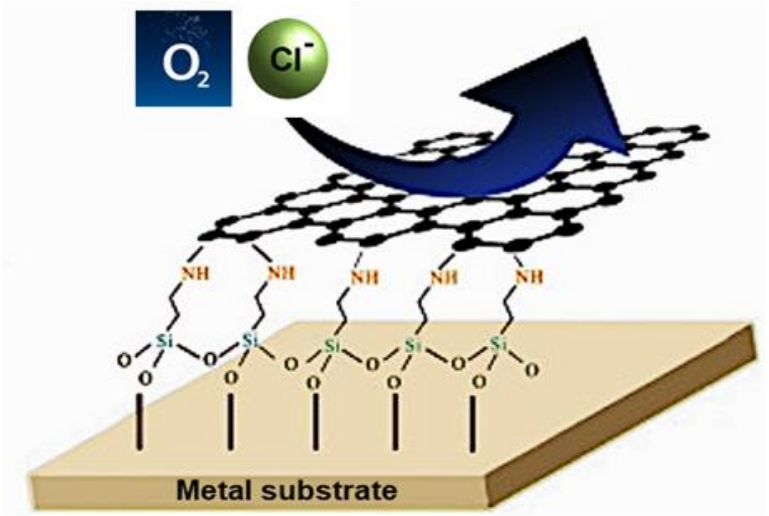
Enhancing thermal conductivity (approx. 4000wm-1/k-1)- 0.01% A Few layer graphene flake compared to the total mass of lubricant improved its thermal conductivity by 17%.

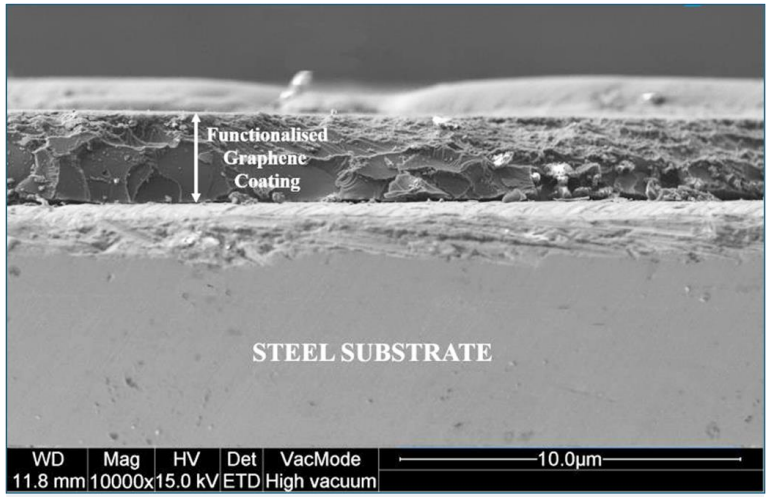
Thinness (single layer 0,3nm)

Super lubricity with an extremely low coefficient of friction (COF) of less than 0.01 can be attained at the nanoscale and microscale friction tests.

Vision: life-time increase and costs reduction (shield against corrosion, replace other anti-corrosion expensive process)

Graphene in Anti-corrosion Graphene Coating





Functionalised graphene coating on mild steel

Graphene acts as an impermeability barrier. Graphen improves the corrosion resistance on SS in acidic media: Corrosion resistance of SS316 plate improved x 500, The corrosion resistance of the SS304 plate improved x 20.

Graphene-coated galvanized steel allows to reduce zinc coating weight.

Graphene technology is applied in marine coating: Graphene formulation improves corrosion protection & Antifouling coating.

Graphene in Textiles

Durability and Strength : Incorporation of graphene can increase fabric tensile strength by up to 50%, making textiles tougher and more resistant to wear and tear.

Thermal and Electrical Conductivity : Graphene-enhanced textiles distribute heat evenly and can potentially incorporate wearable electronics due to improved electrical properties.

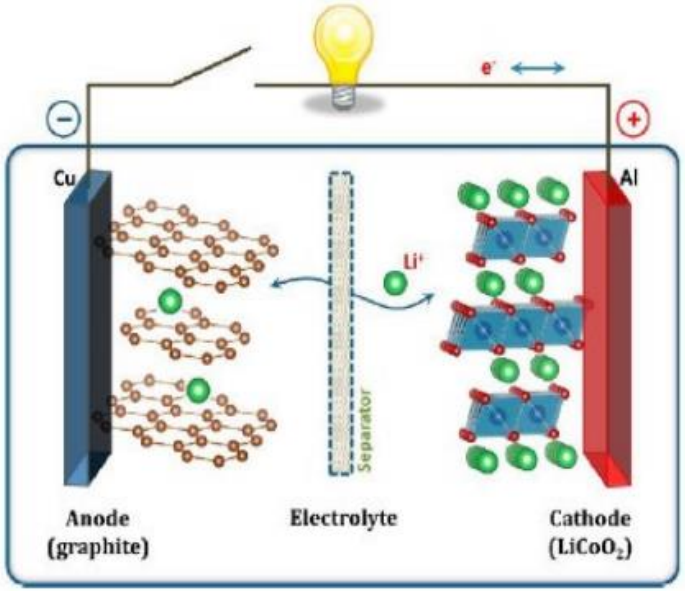
Antibacterial Properties : Graphene coatings can reduce bacterial growth by over 90%, ensuring fabrics remain hygienic and odor-free.

UV Protection : Offers over 95% efficiency in blocking harmful UV ray, protecting both the fabric and wearer.

Water and Stain Resistance : Increases in water and stain resistance by up 50% or more, while maintaining fabric breathability.

Vision: improve performance in energy storage (best compromise between conductivity and structural integrity)

Graphene in Li Battery

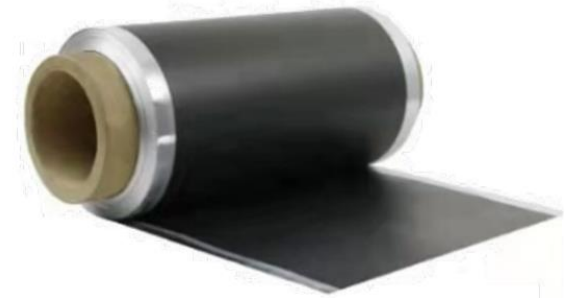


Key enabling features are:

- **Enhanced Electrical Conductivity: The battery's ability to charge and discharge quickly without significant loss of capacity.**
- **Longer lifetime (number of cycles)**
- **Thermal Stability and Reduced Decomposition Risk**
- **Greater energy density through thicker electrodes and alternative anodes**
- **It enhances the electrode's stability, especially during repeated cycles, and reduces the risk of cracking or delamination.**
- **Compatibility with Fast-Charging Applications**
- **Potential for Lower Additive Loading**

GRAPHnova by C-itech

Graphene in Carbon Fibre



- **Increased Strength and Stiffness: Graphene enhances the tensile strength and stiffness of carbon fiber composites by up to 30%, facilitating the creation of lighter and more robust materials.**
- **Improved Impact Resistance: The integration of graphene improves impact resistance by approximately 25%, helping to minimize damage under dynamic stress conditions.**
- **Enhanced Thermal Conductivity: With graphene, thermal conductivity can increase by over 70%, ideal for applications requiring rapid heat dissipation.**
- **Corrosion Resistance: Graphene contributes to a 50% increase in corrosion resistance, protecting materials from environmental degradation**

ISO 14001

ISO 45001

CERTIFIED IATF 16949:2016 COMPANY

C-ITECH

Cité Industrielle & Technologique

PÔLE EUROPÉEN DE LA CÉRAMIQUE

MEMBRE DU PÔLE AÉRONAUTIQUE

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PÔLE D'EXCELLENCE RÉGIONAL