



CREATING ADVANCED 2D COMPOSITE SOLUTIONS



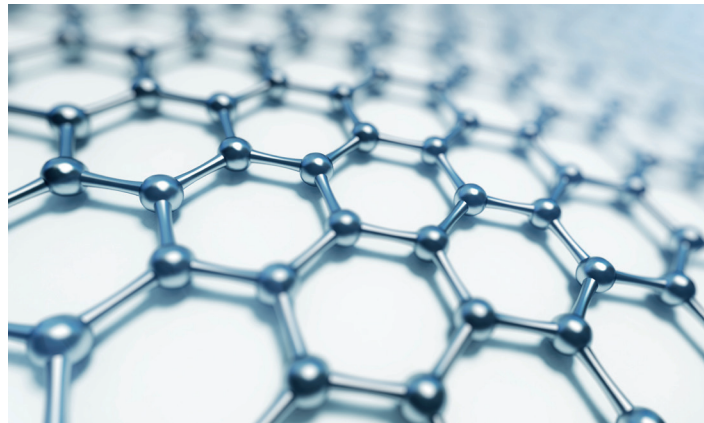
LEADERS IN GRAPHENE MASTERBATCH TECHNOLOGY

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WHAT IS GRAPHENE?

GRAPHENE IS A UNIQUE MATERIAL WITH EXTRAORDINARY PROPERTIES.

Graphene is a one-atom-thick layer of carbon atoms arranged in a hexagonal lattice. It is the building-block of Graphite (which is used, among other things, in pencil tips), but graphene is a remarkable substance on its own - with a multitude of astonishing properties which repeatedly earn it the title **“wonder material”**.



PROPERTIES:

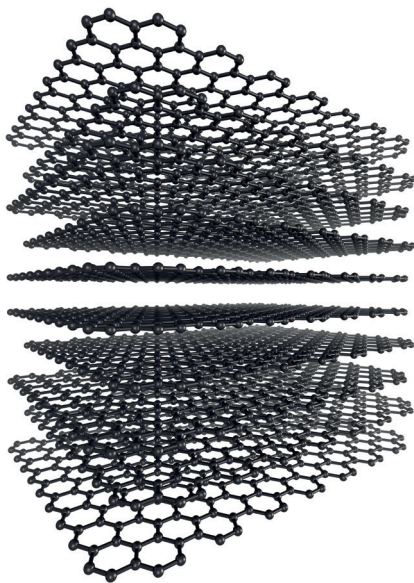
- ✳ The strongest material ever tested.
- ✳ Thinnest imaginable material – one atom thick.
- ✳ High surface area (2630 m²/g).
- ✳ Transparent to light with high optical clarity (up to 97.7%).
- ✳ Exceptional mechanical properties (higher stiffness than diamond, strength = 130 Gpa).
- ✳ About 200 times stronger than steel.
- ✳ Extremely flexible material.
- ✳ Record of electrical and thermal conductivity.
- ✳ Easily chemically functionalised and processable.

The challenge has been the ability to realise the unique properties of Graphene in a useable and commercial platform. The most important problem is the preparation of high-quality and well defined bulk graphene that is fully dispersed in polymer matrices. Developed after years of collaborative research with Graphene manufacturers, Colloids is pleased to be unlock the potential of Graphene thermoplastic composites with its range of GRAPHANCED® masterbatches.

Many complex factors influence the enhancement of the properties, including the correct material selection, the ability to obtain a homogenous dispersion of the 2D material in the base polymer, processing techniques, the platelet orientation of the 2D materials in the base polymer and their aspect ratio and loading level within the base polymer. Therefore, it is essential to carefully select the ingredients of the composite formulation and optimise the synthesis conditions to obtain advanced 2D composites with the desired properties.

GRAPHENE & 2D ENHANCED COMPOSITE MATERIALS

You've probably heard about graphene and 2D materials before but what does this have to do with composite materials? Composite materials are made up of two or more different types of materials. Graphene and 2D materials could replace at least one component in order to create composites with enhanced properties.



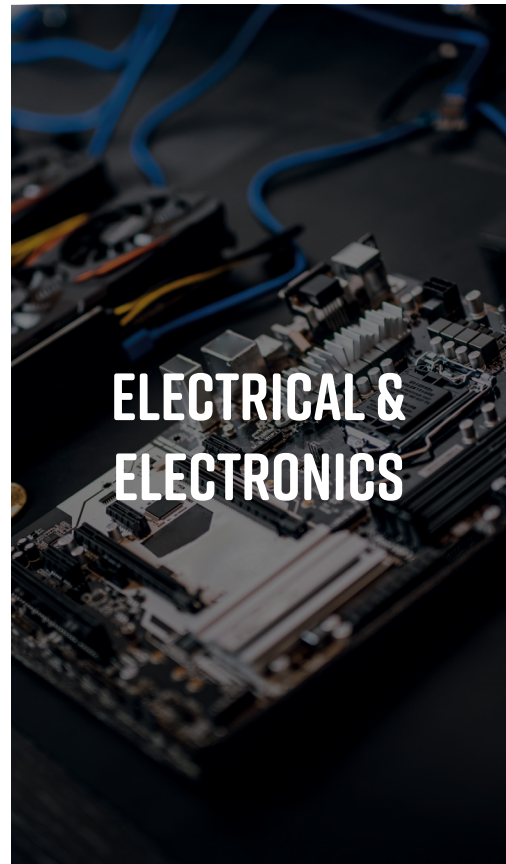
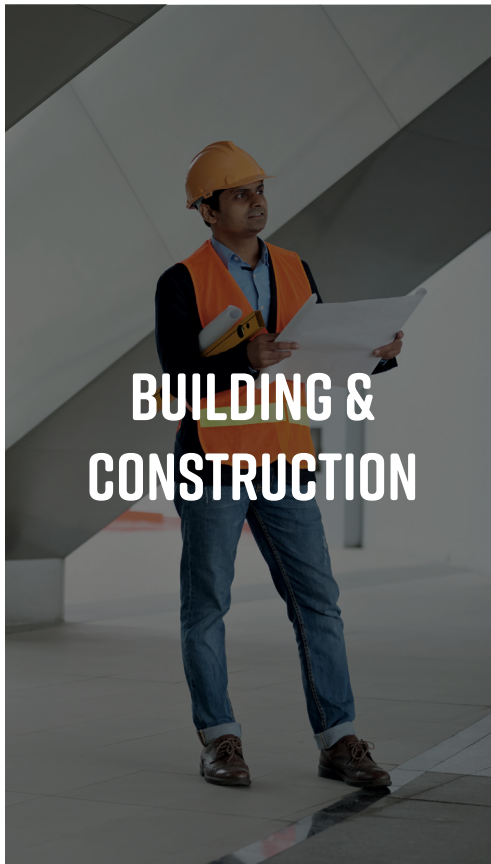
Incorporation of graphene (and other 2D materials) into composite formulations is a promising approach to further enhance our ability to tailor the properties of plastic materials for specific applications. Mechanical, electrical and thermal properties can all, in principle, be modified to address specific targets by formulating suitable composite synthesis processes.

COMPOSITES: WHY USE 2D MATERIALS?

PERFORMANCE IMPROVEMENT TARGETS

- Mechanical Reinforcement
- Impact Performance
- Flexibility
- Weight Reduction
- Robustness, Stiffness
- UV Protection
- Electrical Conductivity
- Anti-Static
- Thermal Management
- Barrier Properties
- Fire Retardancy
- Wear Resistance

SECTORS TO INTRODUCE GRAPHENE & 2D ENHANCED MATERIALS



INNOVATIVE GRAPHANCED® MASTERBATCH

The GRAPHANCED® is a range of graphene masterbatches for thermoplastic and thermoplastic/elastomer polymers.

The base resins of the GRAPHANCED® product range include (but not limited to) PA6, PA66, PBT, PET, PC, polyolefins, PS, SAN, EMA, TPEs, TPUs.

Work is underway for development of GRAPHANCED® products to be compatible with higher-end polymers such as PEEK, PPS.

Colloids joined forces with key partners and are now leading the graphene masterbatch industry to fully commercialise exciting new products with enhanced functionality powered by graphene and other 2D materials and nanomaterials.



BESPOKE GRAPHENE MASTERBATCH SERVICE

Colloids provides a bespoke graphene masterbatch facility for its customers and can tailor the products based on their unique requirements including all thermoplastic base polymers, from everyday commodity to ultra-performance polymers.

Depending on the customer's final application and required product performance, Colloids can recommend if a graphene based solution is what is required.

To discuss your bespoke project with Colloids please contact Colloids on **+44 (151) 546 9222** or email: **sales@colloids.com**

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