XG sciences

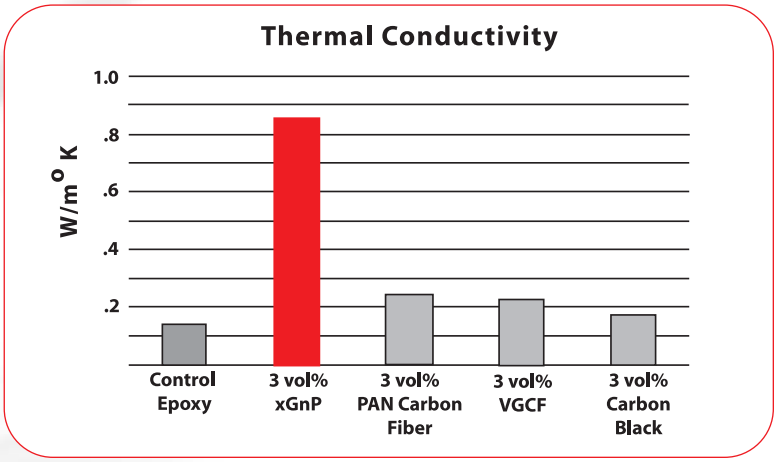
Multifunctional Nanomaterials

xGnP® Graphene Nanoplatelets

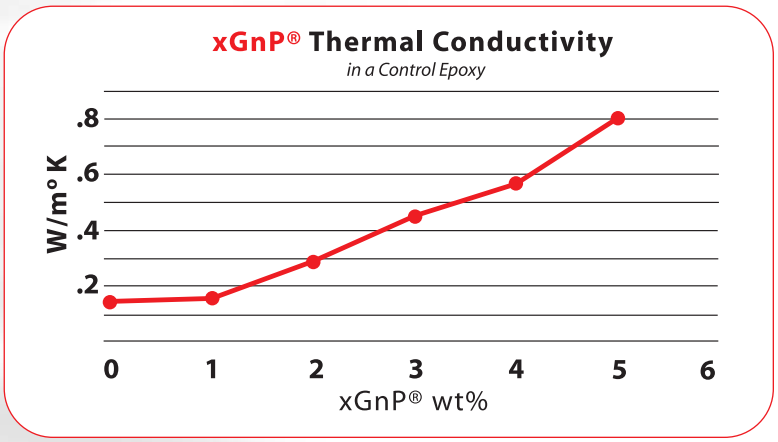
Carbon Nanoparticles with Multifunctional Capability

Enhancing Thermal Conductivity with xGnP® Nanoplatelets

xGnP® *graphene nanoplatelets* can be used to significantly increase the thermal conductivity of most polymeric materials. Like other carbon-based technologies, the graphene sheets that form these nanoplatelets are both thermally and electrically conductive. Unlike nanotubes or carbon fibers, however, the platelet morphology provides lower thermal contact resistance at lower loading levels, resulting in higher thermal conductivity vs. other carbon particles or fibers.

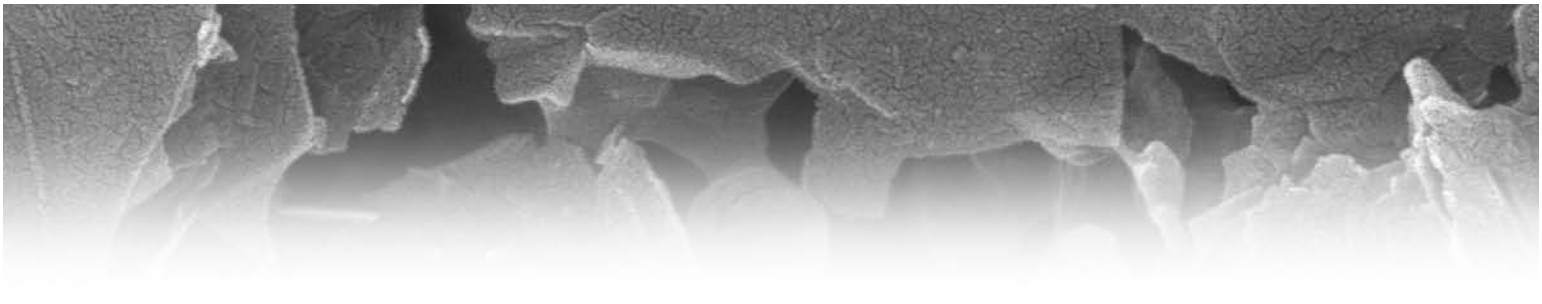


xGnP® *nanoplatelets* can be used to lower the *coefficient of thermal expansion* (CTE) of most polymers and increase ultimate use temperature (T_{ult}) values. Dimensional stability and operating temperature range are also increased, making polymers modified with **xGnP®** *nanoplatelets* excellent for dimensionally critical parts in thermally demanding environments.



Compared with other carbon materials, **xGnP®** *nanoplatelets* typically show significantly better thermal conductivity at similar loadings.

And versus nanoclays, **xGnP®** *nanoplatelets* can be used to improve CTE while also providing electrical conductivity to facilitate manufacturing operations like electrostatic painting.



Comparison of Thermally Conductive Fillers for Various Properties

	Conventional Thermally Conductive Additives					*Nano-Scale Thermally Conductive Additives*		
	Aluminum Nitride Ceramics	**Boron Nitride Ceramics**	**Aluminum**	**Copper**	**Pitch-Based Graphite Fibers**	**Carbon Fiber**	**Carbon Nanotubes**	**xGnP® *Nanoplatelets***
Thermal Conductivity	Moderate	Moderate	High	High	Moderate	High	Very High	Very High
Effect on Resin Processability	Abrasive	Abrasive	Abrasive	Abrasive	Abrasive	Moderate	Moderate	Moderate
Impact on Resin Toughness	Poor	Poor	Poor	Poor	Poor	Fair to Good	Moderate	Good
Relative Weight	Moderate	Moderate	High	High	Moderate	Light	Light	Light
Filler is Also Electrically Conductive	No	No	Moderate	Yes	Yes	Yes	Yes	Yes
Relative Cost	Moderate	High	Low	Moderate	High	Moderate-to-High	Very High	Low-to-Moderate

About xGnP® Nanoplatelets

xGnP® *graphene nanoplatelets* are unique particles consisting of very-thin platelets of crystalline graphite. Typical particles of **xGnP®** *nanoplatelets* consist of stacks of one or more graphene sheets, which form a *platelet*. Each *platelet* is typically 2 – 10-nm thick and its diameter – a feature that we control – can range from submicron to 100 µm in size. The graphene sheet that forms the basal plane of these platelets is identical in composition to the graphene wall of a carbon nanotube, only in a flat sheet form. Edges of the platelets are the sites for functionalization, which helps facilitate hydrogen or covalent bonding within a polymer matrix.

The unique size and platelet morphology of **xGnP®** *nanoplatelets* makes these particles especially effective at providing barrier properties, while their graphene structure makes them excellent thermal and electrical conductors. Unlike many other additives, **xGnP®** *nanomaterials* improve mechanical properties like stiffness, strength, and surface hardness of the matrix material. **xGnP®** *graphene nanoplatelets* are compatible with almost all polymers and available in a range of masterbatch compositions.

Our Competitive Pricing Advantages

The unique price and performance properties of **xGnP®** *nanoplatelets* allow them to be cost-competitive with both far-more-expensive nanoparticles (e.g. single- or multiwall nanotubes) as well as additives with less functionality (e.g. carbon black and metal flake or fiber) in a broad range of applications.

To Learn More

For more information on **xGnP®** *nanoplatelets* and the products made with them, please contact us at:

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