Highly Conductive NGP/Epoxy Composites

高熱・電気伝導性を持つナノグラフェンプレートレット/エポキシ樹脂複合材料

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The increasing demand for smart, small and faster equipment and electronic devices has created a need for novel materials. In addition, industry has a growing need to tailor the properties of materials, including thermal and electrical conductance, for designated applications. Polymers are commonly known due to their thermal and electrical isolating properties. Conductive polymer composites can substitute for metals in many vast applications. Carbon based nano materials have an important role to increase or modify polymer properties such as thermal and electrical conductivities.

Some of the advantages of conductive polymers, compared to metals, are their chemical resistance, lower density, corrosion or erosion resistance, oxidation resistance, increased processibility, low cost production and the many possibilities for property adjustment to fit the special purposes.

The main application for thermally conductive polymers is heat sinks and spreaders. The use of nano-scale fillers such as metals, semiconductors, organic and inorganic particles, and fibers, especially carbon structures are of particular interest and the subject of intense investigation. On the other hand the unique properties of carbon allotropes such as CNT and Graphene offer crucial advantages over other nano-fillers.

Our current efforts to exploit the attractiveness of carbon based material have focused on composites containing Multi and Few Layer Graphene Sheets (MLGS and FLGS) created through our engineered process, which have outstanding thermal, electrical and mechanical properties with significant promise in a vast range of applications.

The potential of using MLGS and FLGS as filler in polymer composite compare to other allotropes has not been fully investigated yet. Our research shows that compare to other carbon containing material, MLGS have magnificent results for enhancing both electrical and thermal conductivity.

Thermal conductivity of the composites increases as the filler content increases, as instance for just 20 percent MLGS containing epoxy composite, In-plane and out-plane thermal conductivity can reach 35 and 15W/mK respectively, with the same composition electrical resistivity decreased to $5.00*10^{-2}$ Ω.cm.

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