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ENHANCED THERMAL CONDUCTIVITY OF POLYMER NANOCOMPOSITES FILLED WITH GRAPHENE SHEETS

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Polymers have a number of advantages, including ease of fabrication and low mass density. However, in the context of using them as heat spreaders, they suffer from their low thermal conductivity. This deficiency has lead to further research on developing thermally conductive polymer composites or nanocomposites filled with carbon nanotubes. Graphene sheets could be a cheaper alternative. Their thermal conductivity and mechanical properties may rival the remarkable in-plane values for graphite. The key breakthrough required to make the polymer-graphene nanocomposites thermally conductive is to enhance the dispersion of graphene in the polymer matrix and promote the linkage between graphene and the polymer matrix. A series of parametric studies were conducted to compare the effectiveness of graphene sheets, carbon nanotubes, and pitch-based carbon fibers on promoting the thermal conductivity of polymer composites or nanocomposites filled with them. The potential synergistic effects between graphene sheets and the other two fibrous fillers were also investigated. The thermally conductive composite allows cost-effective opportunities to injection mold three-dimensional, net-shape microelectronic enclosures with superior heat dissipation performance.