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Enhanced thermal conductivity of commercial polystyrene filled with core-shell structured BN@PS

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Abstract

Polystyrene-wrapped boron nitride/commercial polystyrene (BN@PS/CPS) composites with high thermal conductivity were fabricated by a novel approach. The route included two steps, BN@PS core-shell structured fillers were prepared by using modified BN and styrene (St) as the raw materials via suspension polymerization, and then the BN@PS were kneaded with the CPS by mechanically mixed method. The composite achieves a high thermal conductivity of 0.692 W/mK containing 30 wt% BN@PS (~15.9 wt% BN), which is 3.72 times higher than that of pure CPS of ~0.186 W/mK and 1.78 times higher than that BN/CPS blend composite with at the same BN loading of 0.332 W/mK. Compared with traditional routes, the novel preparation process requires less BN fillers when improving the same thermal conductivity. Importantly, other polymers can also encapsulate BN through this strategy, which paves a new way for preparing thermally conductive polymer-matrix composites.

Keywords: A. Polystyrene-wrapped boron nitride/commercial polystyrene (BN@PS/CPS) composites; B. BN@PS filler; C. Modelling; D. Thermal properties.

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