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An infiltration method to synthesize thermoplastic polyurethane composites based on size-controlled graphene foams

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Abstract

Graphene foams (GFs) with different sizes were prepared and applied to design thermoplastic polyurethane (TPU)/GF nanocomposites by infiltration method. Size-controlled GFs were successfully synthesized with variable concentration of graphene oxide (GO). Stable framework of GFs contributed to uniformity of composites and endowed them preferable thermal and mechanics performance. Results of TGA and MCC manifested that thermostability and flame retardancy of composites were superior to pure polymer, which was contributed to laminar barrier effect of GFs. Compression modulus of composite reached up to 2041.29 KPa, which was much higher than GFs. Due to porous structure, both GFs and TPU/GF composites exhibited quite low value of thermal conductivity. Char residue of TPU/GF composites not only remained original shape, but withstood certain pressure, which decreased potential fire risk. Polymeric materials design, based on GFs, is a feasible scheme to obtain composite with good integrated performance.

Key words: graphene foam; thermoplastic polyurethane composites; polymeric material design; thermal and mechanical properties.

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