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Polymer grafted reduced graphene oxide sheets for improving stress transfer in polymer composites

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Abstract: Chemically reduced graphene oxide (CRGO) sheets grafted with poly(methyl methacrylate) (PMMA) polymer were prepared by an emulsion polymerization to improve the stress transfer in the PMMA/CRGO composites. The electron microscopy observations revealed that the PMMA polymer grafting modification produced good dispersion/exfoliation of CRGO sheets in PMMA matrix and strong sheet/matrix interfacial interaction, leading to efficient stress transfer in the composites. The dynamical mechanical analysis showed that the PMMA-grafted-CRGO sheets provided much more enhancements in both storage modulus and glass transition temperature of PMMA polymer than the pristine sheets. The tensile properties and creep and recovery behaviours further demonstrated that the PMMA composite filled with 1.0 wt.% PMMA-grafted-CRGO sheets simultaneously improved tensile strength (15%), elastic modulus (42%), 1800 s creep and 5000 s unrecovered strains (31 and 37%) as compared with the pure PMMA polymer.

Keywords: A. Polymer-matrix composites (PMCs); B. Mechanical Properties; B. Creep; B. Interface; D. Scanning electron microscopy (SEM).

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