

207c Nanoparticles and Long Fibers Reinforced Thermosetting Composites

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Nanoparticles, such as nanoclay and carbon nanofibers, are promising candidates for reinforcing various polymer matrices. The polymer nanocomposites have some unique properties, such as good barrier properties and excellent thermal performance. But due to the dispersion difficulty, the loading of nanoparticles often cannot reach high level (<10 wt%). Thus, mechanical properties of polymer nanocomposites are relatively low compared with those of highly loaded fiber-reinforced plastics (>50 wt%). In this study, we try to combine the advantages of both polymer nanocomposites and fiber-reinforced plastics to produce a new composite with superior properties. In this study, epoxy, phenolic, and unsaturated polyester resins, the most important thermoset polymers, are used as polymer matrices. Polymer composites with various long fibers and nanoparticles are synthesized by different processes. Then, the dispersion of nanoparticles in the composites and the adhesion between long fiber and polymer matrix are characterized by electron microscopy. The mechanical and thermal properties of these composites are compared with both continuous fiber-reinforced composites and polymer nanocomposites. The optimal conditions of sample preparation and processing are also investigated to achieve the good dispersion of nanoparticles in the polymer matrix and excellent properties of the hybrid composites.