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Studies on Organic and Inorganic Micro/Nano Particle Reinforced Epoxy Composites

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Abstract : Fibre based nano particles are presently considered as one of the potential filler materials for the improvement of mechanical and physical properties of polymer composites. Due to high matrix-filler interfacial area there will be uniform and homogeneous dispersion of nanoparticles. In micro/nano filler reinforced composites, resin material is usually tailored by organic or inorganic nanoparticles to have improved matrix properties. The objective of this study was to compare the potential of reinforcement of different organic and inorganic micro/nano fillers in epoxy composites. Industrial and agricultural waste of fibres like Agave Americana, cornhusk, jute, basalt, carbon, glass and fly ash was utilized to prepare micro/nano particles. Micro/nano particles were obtained using high energy planetary ball milling process in dry condition. Milling time and ball size were kept constant throughout the ball milling process. Composites were fabricated by hand lay method. Particle loading was kept constant to 3% wt. for all composites. In present study, loading of fillers was selected as 3 wt. % for all composites. Dynamic mechanical properties of the nanocomposite films were performed in three-point bending mode with gauge length and sample width of 50 mm and 10 mm respectively. The samples were subjected to an oscillating frequency of 1 Hz, 5 Hz and 10 Hz and 100 % oscillating amplitude in the temperature ranges of 30°C to 150°C at the heating rate of 3°C/min. Damping was found to be higher with the jute composites. Amongst organic fillers lowest damping factor was observed with Agave Americana particles, this means that Agave americana fibre particles have betters interface adhesion with epoxy resin. Basalt, fly ash and glass particles have almost similar damping factors confirming better interface adhesion with epoxy.

Keywords : ball milling, damping factor, matrix-filler interface, particle reinforcements
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