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Study on the Morphological, Dynamic Mechanical and Thermal Properties of PLA Carbon Nanofiber Composites

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Abstract

This work explores the dynamic mechanical, morphological and thermal characteristics of melt blended and injection moulded PLA carbon nanofiber (CNF) composites. Composites of neat PLA with 1, 3, 5, 10, and 15 wt% as received VGCNF were evaluated by DMA, MDSC and SEM. SEM images reveal significant fiber pullout. Damping properties were evaluated by isothermal frequency sweeps at different displacement amplitudes performed on the composites in the DMA. At any displacement amplitude, the damping of the composites rises with increase in CNF content – with the highest damping seen in PLA with 10wt% CNF. Higher displacement amplitudes significantly increase the damping of neat PLA. The tensile modulus shows a rise of almost 50% at 15wt% CNF content. MDSC reveals that the glass transition is not significantly affected the presence of CNF. Crystallization is seen to be favoured with the presence of CNF and is prominently seen during the cooling cycle.

Keywords: A. Fibres C. Injection moulding B. Internal friction/damping B. Thermal properties