



Technological Advances and Research Prospects in Polymer Composites

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Abstract

Polymer nanotechnology has triggered tremendous proliferation in application of nanographene in development of multifunctional nanocomposites. Polymer nanocomposites are being utilized in packaging, sports equipment, automobile sector and bio-medical applications due to their exceptional property combination and distinctive design feasibility. Nanographene has high aspect ratios than many nanosize fillers such as carbon nanotubes and clays, better mechanical properties than many polymers, so they are favored as a filler material in polymer matrix composites. In this study, the effect of nanographene (NG) on the mechanical properties and morphology of nanocomposites prepared with fluted pumpkin stem flour (FPF) and recycled high density polyethylene (HDPE) were experimentally investigated. Four weight levels of nanographene 0, 0.5, 1.5 and 2.5 wt % were mixed with 65 wt. % HDPE and 35wt. % FPF produced by melt compounding and the extruded nanocomposites was shaped by injection molding machine for the mechanical tests. The mechanical test results showed that when 0.5 wt % of NG was added, flexural strength, flexural modulus and notched impact strength reached their maximum values of 24.77MPa, 1800MPa and 32.61J/m², compared to the control (without NG) samples, 0 wt % NG addition the flexural strength, flexural modulus and notched impact strength gave lower values: 20.5MPa, 1500MPa and 19.35J/m² respectively. Although the addition of NG into the polymer matrix effectively improved mechanical properties, these improvements came at proper NG loading of 0.5 wt %. Morphological study confirmed that the samples with 0.5 wt. % of NG showed no fiber pullout/holes, whereas higher contents (1.5-2.5 wt %) of NG showed fiber pullout/holes and were easily agglomerated. This study has shown that fluted pumpkin stem agro-waste material could be used in composite formulation with comparable results to wood-plastic-composites (WPC).

Keywords: Nanographene, Agricultural waste, Nanocomposites, Mechanical, Morphology.

Biography

S A Mohan Krishna is a Mysore based academician, an associate professor in the Department of Mechanical Engineering at Vidyavardhaka College of Engineering, Mysuru, India. He has been awarded with numerous states, national and international awards for engineering education, science popularization and communication. He has been in the editorial board for over 150 prolific national and international journals as well as acclaimed international professional bodies. Dr. Mohan Krishna has published over 100 papers in peer reviewed international journals and has presented papers at Qatar (ICAMR), Bangkok and Singapore (ICMAT) in international conferences, also virtual conferences scheduled at USA, France, Spain, China, Belgium and many other nations and also national conferences in various parts of India. Since 1997, he started delivering lectures when he was an engineering student. He has given over 170 programmes in television and radio too and has delivered over 800 talks in Science, Education, Engineering, Astronomy and general topics.



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