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**Sustainable Biocarbon Reinforced Nylon 6/Polypropylene Compatibilized Blends:
Effect of Particle Size and Morphology on Performance of the Biocomposites**

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Abstract

The effects of biocarbon particle size and shape on the thermo-mechanical properties of Nylon6/Polypropylene compatibilized blends were investigated at 25% loading. The biocarbon particles were milled to a size from $\sim 7\mu\text{m}$ down to $\sim 800\text{nm}$, in which the aspect ratio was reduced from ~ 5 to ~ 1 . Corroboration of SEM and AFM of biocomposites illustrated a high biocarbon-matrix interaction and a reduction in the size of dispersed PP droplets after biocarbon addition. Morphological disparities between nano- and micro-sized biocarbon (porosity, particle shape) were correlated to thermo-mechanical properties of the biocomposites, particularly strength and thermal expansion, and supported by DMA experiments. Rheological investigation showed alignment in the shear direction for the widely distributed particles size at low frequencies and an unexpected plateau for all the biocomposites, attributed to the particle size and shape heterogeneities. The presence of porous biocarbon in any form showed no negative influence on the thermal stability of biocomposites.

Keywords: Biocarbon, Irregular particle shape, (A) Biocomposite, (A) Particle-reinforcement

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