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Bio-Derived Aliphatic Hyperbranched Polyurethane Nanocomposites with Inherent Self Healing Tendency and Surface Hydrophobicity: Towards Creating High Performance Smart Materials

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KEYWORDS *bio-derived polyurethane; nanocomposite; aliphatic; smart material*

ABSTRACT

Smart materials with high performance are useful for multi-dimensional utilities. In this context, bio-resource derived aliphatic hyperbranched polyurethane nanocomposites (HPU/Si-GO) were fabricated *in situ* with different wt% of the 3-aminopropyltriethoxysilane-modified graphene oxide sheets (Si-GO). The nanocomposites were characterized by FT-IR, Raman, PXRD, EDX, SEM and TEM analyses. Significant enhancements of mechanical properties like tensile strength (~247%), elongation at break (~206%) and toughness (~339%) were observed upon incorporation of very low amount (upto 2 wt%) of Si-GO in HPU matrix. The nanocomposites exhibited excellent self healing ability under microwave (within 50-60s at 450 W) and sunlight (within 4-6 min under 10^6 lux) exposure with high efficiency (upto 100%). The surfaces of the nanocomposites also displayed inherent hydrophobicity (water contact angles upto 105°) without any additional surface modification. Hence, development of such high performance polymeric materials with inherent smart features augurs well for versatile applications including self healing and self cleaning materials.

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