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Molecular nano composites and super molecular nano composites based on flexible polymers & flexible polymer blends reinforced by rigid rod Poly-p-phenylene-terephthalamide (PPTA)

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Homo- and co-polymers have been classified as the first generation polymers; particulate and fibre reinforced polymer composites and polymer blends as the second generation polymers; and molecularly reinforced polymer blends as the third generation polymers. Nano polymers, nano polymeric composites and molecular nano composites are emerging as the fourth generation polymers. A molecular composite is a miscible blend of an intrinsically rigid rod macromolecule and a flexible polymer, conceptually similar to a nano reinforced composite, except that the flexible polymer is reinforced by the rigid rod macromolecule at the molecular nano level and the reinforcing rigid rod macromolecule, acts like a single wall nano tube (SWNT). The concept has been extended to super molecular nano composite – a nano material in which is a miscible blend of two flexible polymers is molecularly reinforced at nano level by an intrinsically rigid rod macromolecule and the reinforcing rigid rod macromolecule, acts like a single wall nano tube (SWNT). Engineering properties of molecular nano composites and super molecular nano composites are governed by the aspect ratio of the single intrinsically rigid macromolecule functioning analogous to single wall nano tube (SWNT) and thermodynamic miscibility between the rigid and the flexible polymer.

Molecular nano composites of polyetheretherketone reinforced by poly-p-phenylene-terephthalamide and super molecular nano composites of blend of polyamide-6,6 and polyetherketone reinforced by poly-p-phenylene-terephthalamide and of blend of polyamide-6,6 and polyamide-6 reinforced by poly-p-phenylene-terephthalamide with poly-p-phenyleneterephthalamide acting analogous to a single wall nano tube reinforcer at nano level have been developed. Nano level dispersion of rigid polymer in the flexible polymer by establishing miscibility in the system and the details of mechanical properties resulting from the molecular reinforcement at nano level are being reported in this study.

Biography

Sanjay Palsule obtained B E in Chemical Engineering from NIT Raipur and a PhD from Heriot-Watt University, Scotland, UK. He is Associate Professor of Polymer Engineering in Indian Institute of Technology-Roorkee. He is well known for his work on polymer blends, polymer composites, molecular nano composites and applications of these materials for aerospace structures. He has obtained several patents on aerospace polymers & composites; published more than 25 peer reviewed papers, and chaired sessions and delivered invited lectures in various International Conferences. He is Editor-in-Chief of Encyclopedia of Polymers & Composites (Springer).

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Preparation of Polystyrene–Organo clay nanocomposites

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In this study, the use of two molecular weight of Polystyrene (PS), 125000 and 160000 g/mole to prepare PS/organoclay nanocomposite was investigated. Nanocomposites having 5 phr (part per hundred) organo clay were prepared by by solution technique at different sonication time. Organophilic clay (OC) was prepared by ion exchange between Na+ions and then by cationic surfactants Cetylpyridiniumbromide (CPDr) in an aqueous medium to act as interchalting agent between PS and clay. Polystyrene - OC nanocomposites were prepared by by solution technique under sonication at different wt % of OC (1-20%). The intercalation /exfoliation of the clays within Polystyrene matrix was evaluated using x-ray diffraction (XRD) and transmission electron microscopy (TEM). Exfoliation was achieved for PS nanocomposites with a clay concentration as high as 20 wt%. For both of Polystyrene, fully exfoliated nanocomposite was observed at all OC content (1-20 wt %) .The thermal analysis of the Polystyrene -OC nanocomposites were characterized using thermogravimetric analysis (TGA) and deferential scanning calorimetric (DSC).

Biography

Mekhamer has completed his Ph.D at the age of 32 years from Alexandria university, Egypt, institute of graduate studies and research, material science department, She is a professor of physical chemistry in chemistry department, college of science , King Saud university , Saudi Arabia since 1999 until now. She has published more than 35 papers in reputed journals and serving as an editorial board member in journal of Saudi chemical society.

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