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Graphite reinforced polymer nanocomposites for conducting packaging applications

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Polymer or copolymer based expanded graphite (EG) reinforced nanocomposites were prepared by *in situ* polymerization technique without using any emulsifier. Graphite shows excellent electrical, mechanical and thermal properties and possesses high aspect ratio and low density, for which graphite taken as filler for preparation of nanocomposites. EG was prepared by treatment of raw graphite with a mixture of concentrated H_2SO_4 and HNO_3 (ratio 4:1, v/v) followed by heating at 900°C for one minute in a muffle furnace. The synthesized nanocomposites were characterized by Fourier Transform Infrared spectroscopy (FTIR) and X-ray diffraction (XRD). The morphology of nanocomposites was studied by scanning electron microscopy (SEM) and transmission electron microscopy (TEM). Electrical, mechanical, thermal and gas barrier properties of synthesized nanocomposites were measured and it was found that these properties were enhanced with increasing proportion of EG. Polyacrylonitrile (PAN)/EG nanocomposites were prepared with different proportions of EG. The tensile strength and electrical conductivity of PAN/EG nanocomposites were measured and it was found that both properties found to be increased with increase in EG concentrations. The oxygen permeability of virgin PAN and PAN/EG nanocomposites was measured and it was found that oxygen permeability of PAN/EG was reduced substantially approximately 13 times with increase in EG content. Poly (methyl methacrylate)/Expanded graphite (PMMA/EG) nanocomposites were prepared by the incorporation of EG in various proportions (1, 2, 3, 4 and 5%) with PMMA The thermal stability and electrical conductivity of PMMA/EG nanocomposites were improved by dispersion of EG with PMMA matrix. Oxygen permeability of PMMA/EG nanocomposites was calculated and it was found that, permeability was reduced by approximately 10 times with rise of EG proportion. Polymethylmethacrylate-co-polyacrylonitrile/Expanded graphite (PMMA-co-PAN/EG) nanocomposites were prepared by the incorporation of EG in various proportions (1, 2, 3 and 4%) into PMMA-co-PAN through *in situ* emulsifier-free emulsion polymerization method. The conductivity and thermal stability of nanocomposites were measured as function of EG concentration. Oxygen permeability of PMMA-co-PAN/EG was approximately reduced by 8 times with increase of graphite proportion. This is because of the fact that the graphite nanoplatelets act as a physical obstacle regarding the movement of the gas.

Biography

Sarat K. Swain has completed his Ph.D. degree from Utkal University, India during 2001. Prof Swain was a post-doctoral fellow at the Department of Polymer Engineering, University of Akron, OH, USA. He has published 60 research papers in different international reputed journals and one US patent to his credit. The research are of Prof Swain is polymer based nanocomposites, Hybrid materials, Biomaterials. He has delivered more than 10 invited talks in different international conferences. Prof Swain is now working as a Professor and Head in the Department of Chemistry, Veer Surendra Sai University of Technology, Burla, Sambalpur, India.

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