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CARBON AND GRAPHITE FILLER COMPOSITES OF ETHYLENE-OCTENE COPOLYMER: POTENTIAL CANDIDATES FOR PRESSURE/ STRAIN SENSORS

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Ethylene-octene copolymer (EOC) is a copolymer which exhibits low density, good elasticity and improved processability and widely being used in the automotive, electrical cable insulation and footwear applications. Conducting polymer composites of EOC (with octene content of 45 wt.%) were prepared using three different types of fillers; expandable graphite (EG), multiwall carbon nanotube (MWCNT) and carbon fiber (CF). EOC/EG composites were prepared by melt blending of EOC and EG, while EOC/MWCNT and EOC/CF composites were prepared by ultrasonication of EOC solutions/filler systems followed by precipitation. Electrical (both AC and DC) and thermal conductivities of composites were measured. Flammability resistance tests of the EOC/EG composites only were carried out and showed that expandable graphite is an excellent flame-retardant filler. Percolation behaviour of EOC/EG composites were observed at around 16 vol.% of filler loading while for EOC/CF it was at, 2.21 vol.% and for EOC/MWCNT, it was at 5.32 vol.% which is a clear indication of effect of filler, or aspect ratio of fillers in the composites. Stress at break and elongation at break of EOC/ MWCNT and EOC/CF composites found increasing initially and followed a downward trend which is mainly due to reduction in chain flexibility which predominates over the reinforcing effect of fillers. From shore-A hardness values, it is clear that even the highest filler level did not reduce the softness of composites. Good electrical/thermal conductivities and improved mechanical properties along with comparable shore-A hardness values of EOC composites with excellent residual strain (εr) of pure EOC which is a direct measure of elasticity of a material, shows the potential of EOC to find its application as strain sensors.

Biography

Rajesh Theravalappil obtained his PhD Degree in Chemistry and Materials Technology from Tomas Bata University in Zlin, Czech Republic in 2012. He joined the Center for Refining and Petrochemicals of the Research Institute, King Fahd University Petroleum and Minerals, Saudi Arabia post completion of his PhD and is currently a Research Scientist. He has 15 years of research and industrial experience in the field of polymer science. His research interest includes: polymer synthesis and characterization, petrochemicals, polymer blends and composites, material development.

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