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INVESTIGATION OF FRICTION AND WEAR PROPERTIES OF SILICON NITRIDE REINFORCED POLYCARBONATE NANOCOMPOSITES

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Polycarbonate (PC) matrix nanocomposites containing 0-20 Vol% nanosized silicon nitride (Si3N4) particles have been prepared by solution mixing method followed by hot pressing at 228°C under a pressure of 45 MPa. To characterize phase purity, particle size and morphology of Si3N4 nanoparticles, a combination of x-ray diffractometry and transmission electron microscopy have been used. The prepared nanocomposites have been investigated for density, microhardness, microstructure and wear resistance. Density and microhardness have been found to increase with increasing volume percent of nanoparticulate. The experimental values of density of composites fall close to those of theoretical values predicted from rule of mixtures thereby suggesting that prepared nanocomposites nearly pore free. The maximum improvement of microhardness of 189% has been observed for nanocomposite with 20 Vol% Si3N4 particles as compared to neat PC. It correlates well a modified rule of mixtures with strengthening efficiency factor of 0.09. Scanning electron micrographs indicated good dispersion of nanoparticles in PC matrix. Friction and wear properties have been evaluated using pin-on-disc method. It has been found that PC-20% Si3N4 nanocomposite exhibits lowest friction coefficient (about 0.2) and highest wear resistance as against pure PC for normal load of 20 N. The improvement of wear resistance has been found to be as high as 68% with PC containing 20 Vol% Si3N4 as against neat PC.

Recent Publications

1. **Nimu Chand Reger, Vamsi Krishna Balla, Mithun Das and A K Bhargava (2018) Wear and corrosion properties of in-situ grown zirconium nitride layers for implant applications. Surface and Coatings Technology 335:357-364.**
2. **P K Sain, R K Goyal, Y V S S Prasad, and A K Bhargava (2017) Electrical properties of single-walled/multi-walled carbon-nanotubes filled polycarbonate nanocomposites. Journal of Electronic Materials 46 (1):458-466.**
3. **P K Sain, R K Goyal, Y V S S Prasad, and A K Bhargava (2016) Polycarbonate based three-phase nanocomposite dielectrics. Materials Research Express 3:1-11.**
4. **P K Sain, R K Goyal, Y V S S Prasad, Jyoti, K B Sharma, and A K Bhargava (2015) Few-layer-graphene/ polycarbonate naocomposites as dielectric and conducting material. Journal of Applied Polymer Science 132: 42443.**

Biography

A K Bhargava has thirty eight years of teaching and research experience at Malaviya National Institute of Technology Jaipur (India). Currently, he is working as a Professor and Head, Department of Metallurgical and Materials Engineering, MNIT Jaipur, India. His areas of specialization include composite materials, rapid solidification of steels, and tribology. He published several research papers and two books namely, "Polymers, Ceramics and Composites" and "Mechanical Behaviour and Testing of Materials". He contributed two book chapters in Elsevier publication.

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