

Optical and physical properties of zirconium dioxide reinforced poly(methyl methacrylate) nanocomposite films

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Abstract

The objective of this study was to investigate the fundamental aspects of acrylic resin and zirconia nanoparticle interaction to analyze the optical properties and subsequent changes in refractive index with incremental loading of nanoparticles. Poly(methyl methacrylate) (PMMA) reinforced with zirconia nanoparticles were prepared by dip coating, spin coating and solvent casting techniques. An overall understanding of the polymer nanocomposite film has been achieved using the spectroscopic and morphological studies. The vital aspect of this whole study is to derive a simple yet an efficient nanocomposite film capable of imparting extraordinary optical properties. Within the limitations of this research a very crucial property of the material has been revealed. The RI as well as the optical transparency of the nanocomposite film has been steadily maintained with a significant increase of RI by the magnitude of 0.06 and ~100% light transmittance on incorporation of pure zirconia nanoparticles into PMMA matrix has been achieved. The best technique found was spin coating as it could yield thin films and better transparency and higher refractive index.