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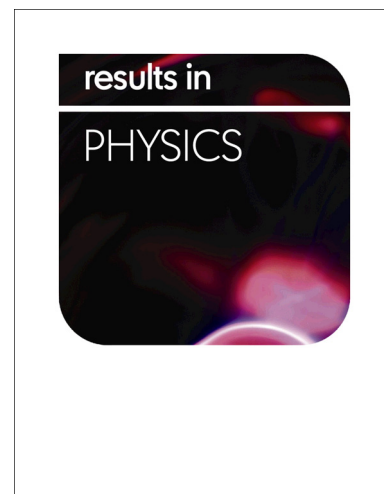
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Fabrication and comparative study of magnetic Fe and α -Fe₂O₃ nanoparticles dispersed hybrid polymer (PVA+Chitosan) novel nanocomposite film

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Abstract

Incorporation of nanoparticles into polymer matrix allows the development of new features that differs from the pure materials. In this research, magnetic nanoparticles reinforced organic biodegradable polymer matrix based biocompatible nanocomposite films were fabricated. This work covered, synthesis of Iron (Fe) and Iron oxide (α -Fe₂O₃) nanoparticles by chemical reduction and sol-gel methods respectively, fabrication of Fe/Poly (vinyl alcohol) (PVA)/Chitosan and α -Fe₂O₃/PVA/Chitosan nanocomposites by solvent casting method, and evaluation and comparison of their mechanical properties to find the superior biocompatible nanocomposite. The X-ray diffraction (XRD), scanning electron microscopy (SEM), and energy dispersive spectroscopy (EDX) analysis confirmed the size, structure, morphology and formation of Fe and α -Fe₂O₃ nanoparticles. Magnetic study showed that, synthesized α -Fe₂O₃ nanoparticle possess better magnetic properties than the Fe nanoparticle. The fourier-transform infrared spectroscopy (FTIR) spectra confirmed the successful interaction of Fe and α -Fe₂O₃ nanoparticles with the polymers matrix. The Iron oxide dispersed (16.67 wt.%) nanocomposite α -Fe₂O₃/PVA/Chitosan showed highest tensile strength and elastic modulus that is respectively 45% and 40% higher than the PVA polymer alone. This novel nanocomposite may potentially be useful in various biomedical applications.

Keywords: magnetic nanoparticles; sol-gel and chemical reduction method; biodegradable polymer; biocompatible nanocomposite; mechanical properties; biomedical applications.

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