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High-performance PVA/PVP-based polymer film with a dual-crosslinked network of nanofillers for effective radiation shielding applications

Conducting polymers have attracted significant attention due to their metal-like conductivity combined with the flexibility and lightweight nature of plastics. Their tunable properties make them highly versatile for advanced technologies. With the growing demand for materials offering large surface areas to control radiation through absorption and reflection, polymer nanocomposites have emerged as promising candidates. Their adaptability and multifunctionality enable integration of diverse properties, making them vital for sustainable technological advancements and enhancing performance in electronic, energy, and shielding applications. The present research work focuses on fabricating a PVA/PVP-based polymer film with a network of conducting Ag2WO4 and CoZnFe2O4 nanofillers. The structural, functional, morphological, and elemental properties of the fabricated films were analysed using XRD, FTIR, SEM, and EDAX, respectively, confirming the successful incorporation of Ag2WO4 and CoZnFe2O4 nanofillers into the PVA/PVP polymer matrix. The electrical properties of the films were measured using an HP 4281A precision LCR meter in the frequency range of 20 Hz to 1 MHz. The AC conductivity of PVA/PVP was measured to be 1.494×10 -5 S/m, which was enhanced to 6.534×10 -4 S/m with the addition of Ag2WO4 and CoZnFe2O4 nanofillers to the film. This enhancement in AC conductivity acts as a foundation for radiation shielding applications.

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