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Impact on Structural, Optical, Impedance and Dielectric Properties of Polymer PVA Loaded with Nanofiller ZnO

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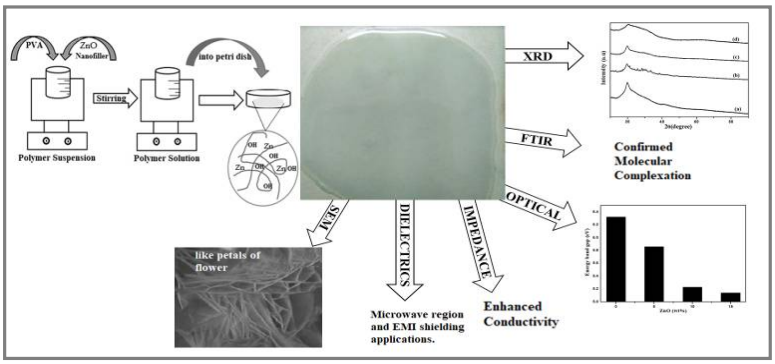
ABSTRACT

Incessant research curiosity has been shown to the fabrication of ZnO blended polymer nanocomposites owing to their extraordinary antimicrobial, catalytic, electrical, mechanical, optical, thermal and medical features. The Solution Casting Method is employed to fabricate PVA-ZnO nanocomposite film by incorporating the filler of ZnO nanoparticles which are synthesized by a novel starch-assisted combustion (SAC) method. XRD study revealed that increasing ZnO loading increases amorphous nature of the PVA-ZnO films. FTIR studies reveal the formation of molecular complex of PVA with ZnO filler. It was observed that ionic conductivity of the films as calculated from A.C. impedance studies tend to depend on the morphology and amorphousity of the films. The dielectric study observed the decreasing dielectric constant (Ɛ') with increasing frequency and it was its maximum for 15wt% ZnO filling in PVA. The band gap energy revealed from UV-Visible spectroscopic studies has revealed that on increasing the ZnO loading band gap of the films decreases. SEM studies illustrated distinctive morphology for each level of ZnO loading in the films which may be important for morphology dependant applications. Thus the study shows that by incorporating ZnO to PVA results in homogenous nanocomposite films with appropriate dielectric constant and conductivity values coupled with unique physical features, divulging their applications in microwave absorption and Electro Magnetic Induction (EMI) shielding in addition to the already known multifarious applications like in optics, sensors etc.

Graphical Abstract



Solution casting method for PVA-ZnO Nanocomposite films.

Keywords: PVA-ZnO, Polymer composites, Band gap, A.C. impedance, Dielectric properties.