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Enhancing the Structural, Optical, and Dielectric Properties of the Polymer Nanocomposites Based on Polymer Blend and Gold Nanoparticles for Application in Energy Storage

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Abstract : Using Chenopodium murale leaf, gold nanoparticles (Au NP's) were biosynthesized effectively in an amicable strategy. The casting process was used to create composite layers of sodium alginate and polyvinyl pyrrolidone. Gold nanoparticles were incorporated into the polyvinyl pyrrolidone (PVP)/ sodium alginate (NaAlg) polymer blend by casting technique. Before and after exposure to different doses of gamma irradiation (2, 4, 6 Mrad), thin films of synthesized nanocomposites were analyzed. XRD revealed the amorphous nature of polymer blends (PVP/ NaAlg), which decreased by both Au NP's embedding and consecutive doses of irradiation. FT-IR spectra revealed interactions and differences within the functional groups of their respective pristine components and dopant nano-fillers. The optical properties of PVP/NaAlg – Au NP thin films (refractive index n, energy gap Eg, Urbach energy Eu) were examined before and after the irradiation procedure. Transmission electron micrographs (TEM) demonstrated a decrease in the size of Au NP's and narrow size distribution as the gamma irradiation dose was increased. Gamma irradiation was found to influence the electrical conductivity of synthesized composite films, as well as dielectric permittivity (ε′) and dielectric losses (ε″).

Keywords : PVP, SPR, γ-radiations, XRD
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