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S-MMICF- structural and morphological modifications induced by 40 MeV C^{5+} ion beam on Au-polyaniline composite films

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The redox properties of conducting polymers are found to be excellent hosts for trapping noble metal particles. The objectives of the present research work includes electrochemical synthesis of Au-Polyaniline (Au-PANI)P composite films and evaluation of the possible structural and morphological changes by SHI irradiation. The synthesized PANI film acts as working electrode for the decoration of Au particles on the surface of PANI film by using cyclo-voltammetry (CV) technique. Later, these films were irradiated under high vacuum ($5x10^{-6}$ torr) at room temperature with 40 MeV C^{5+} ion beam at various fluences ranging from $1x10^{11}$ to $1x10^{13}$ ions/cm^2. SHI irradiation results significant changes in polymer matrix like bond breaking which generates free radicals, molecular fragmentation, creation of new bonds, many of them multiple, and cross-linking etc. Irradiation also induces structural changes in the polymer layer and this enables the nanoparticles to agglomerate. The structural investigation of Au-PANI composite films were performed by using X-ray diffraction (XRD), scanning electron microscopy (SEM) and micro- Raman spectroscopic techniques. The qualitative analysis of modifications induced by increasing fluence in Au-PANI composite films is estimated by calculating the area of diffraction peaks using Gaussian fittings to the data as a function of fluence. In SHI irradiation the momentum of incident photon is shared between inelastically scattered photon and the ejected electron, and not transferred to atom or nuclei, so, leads to modifications in composites. However, irradiation enhances aggregation of Au particles, which results in an increase of the particles. It may be due to the degradation of the polymer due to irradiation. If polymer degrades, again, polymer-metal interaction gets affected and it affects the morphology of the film. Interestingly, SEM and Raman analysis reveals the growth and formation of chain type 1- D structure film. However, irradiation enhances aggregation of Au particles, which may be due to the degradation of the polymer. If polymer degrades, again, polymer-metal interaction gets affected and it affects the morphology of the film. The Au-PANI composites are highly useful in chemical sensing due to their excellent characteristic properties

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