

ABSTRACT

This study aims to synthesize PVA/Ag films and PVA/NBT/Ag films as low-dose X-ray dosimeters and to analyze the effect of varying silver concentrations on the performance of PVA/Ag and PVA/NBT/Ag films. The development of polyvinyl alcohol (PVA), nitroblue tetrazolium (NBT), silver (Ag) is based on the need for dosimeters with high sensitivity, as well as good stability. In this study, variations in Ag concentration (0.25%; 0.50%; 0.75%) were applied to evaluate their effects on optical properties, microstructure, as well as the effectiveness of the films in detecting X-ray exposure. The film synthesis was carried out using the solution casting method, followed by irradiation using X-rays. Film characterization was conducted through UV-Vis spectroscopy for absorbance analysis, fourier transform infrared (FTIR) to determine the functional groups present in the film, energy dispersive X-ray Spectroscopy (EDX) to determine elemental composition, as well as optical density (OD) measurements to evaluate color changes due to radiation exposure. The results showed that the dosimeter films experienced color changes after being exposed to X-rays due to the reduction of Ag^+ ions to Ag^0 , with surface plasmon effects enhancing optical response. OD analysis revealed that OD values increased with higher Ag concentration and increased X-ray exposure. PVA/Ag 0.50% and PVA/NBT/Ag 0.25% concentrations exhibited optimal sensitivity. UV-Vis analysis showed increased absorbance with increasing radiation dose, whereas FTIR confirmed changes in chemical and optical structure. SEM and EDX revealed a uniform distribution of silver nanoparticles without excessive agglomeration. With high sensitivity, good stability, and a simple synthesis process, PVA/Ag and PVA/NBT/Ag films have the potential to be used as X-ray dosimeters for medical applications.

Keywords: *Dosimeter film, polyvinyl alcohol (PVA), nitroblue tetrazolium (NBT), silver (Ag), concentration.*