Optical properties and conductivity of pva–h3 po4 (Polyvinyl alcohol–phosphoric acid) film blend irradiated by γ-rays

ABSTRACT

This study assesses the optical properties and conductivity of PVA–H3PO4 (polyvinyl alcohol–phosphoric acid) polymer film blend irradiated by gamma (γ) rays. The PVA–H3PO4 polymer film blend was prepared by the solvent-casting method at H3PO4 concentrations of 75 v% and 85 v%, and then irradiated up to 25 kGy using γ-rays from the Cobalt-60 isotope source. The optical absorption spectrum was measured using an ultraviolet–visible spectrophotometer over a wavelength range of 200 to 700 nm. It was found that the absorption peaks are in three regions, namely two peaks in the ultraviolet region (310 and 350 nm) and one peak in the visible region (550 nm). The presence of an absorption peak after being exposed to hu energy indicates a transition of electrons from HOMO to LUMO within the polymer chain. The study of optical absorption shows that the energy band gap (energy gap) depends on the radiation dose and the concentration of H3PO4 in the polymer film blend. The optical absorption, absorption edge, and energy gap decrease with increasing H3PO4 concentration and radiation dose. The interaction between PVA and H3PO4 blend led to an increase in the conductivity of the resulting polymer blend film.