

Synthesis and controlling the optical and dielectric properties of CMC/PVA blend via γ -rays irradiation

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Abstract: Carboxymethyl cellulose (CMC)/Polyvinyl alcohol (PVA) blend films were prepared by solution casting method. Then, these films were irradiated with γ -rays from a Co-60 source at doses over the range 0–70 kGy to investigate the modifications induced in the optical and dielectric properties. The dielectric constant (ϵ') was measured in the temperature range 303–408 K and in the frequency range 10 kHz–1 MHz. The indirect optical band gap was found to increase within the dose range 0–10 kGy, and to decrease at the higher doses. The refractive index values, however, showed a reversed behavior. The highest transmittance percentage was obtained at 10 kGy dose. According to the frequency and temperature dependence of ϵ' , α_d -relaxation peaks were observed in all samples and assigned to the micro-Brownian motion of the blend chains. The values of ϵ' showed a decrease in the dose range 0–10 kGy and an increase in the dose range 10–70 kGy. The ac conductivity σ_{ac} (T) showed an Arrhenius type behavior separated into two distinct regions. The results of the present system are compared with those of similar materials.

Keywords: CMC/PVA blend; γ -Rays irradiation; Optical band gap; Refractive index; Dielectric relaxation; AC conductivity.