Abstract

We present our results from the measurements of the third-order optical nonlinearity in Poly (vinyl alcohol) PVA doped six concentrations of Rhodamine B (1×10-6, 5×10-6, 1×10-5, 5×10-5, 1×10-4 and 5×10-4) Ml, and when we find the optimum condition was at 1×10-4Ml, we measured the third order nonlinearity by adding this specific concentration to PVA with a different weight concentrations (1, 2, 3, 4, 5 and 6) wt.% of DNA. The effect of DNA on the nonlinear optical properties of Rhodamine B/PVA films achieved through Z-scan measurements at a wavelength of 1064 nm. Close aperture data demonstrated negative nonlinear refractive index (n2) with a magnitude of (8.66-16.7) ×10-7 cm2/W with varying weight concentrations of DNA, while, the largest value of the nonlinear refractive index in different concentrations of RhB/PVA films was observed at 1×10-4Ml with a positive n2 and a magnitude of (7.64×10-7) cm2/W. Open aperture data demonstrated a strong two-photon absorption with a magnitude of ~ (26.8 ×10-3cm/W) for films doped with (6 wt. %) of DNA. While, a nonlinear absorption coefficient (β) with a magnitude ~ (4.77×10-3cm/W) at the concentration 1×10-4 Ml of RhB/PVA film was recorded. Reverse saturable absorption (RSA) behavior at 1064 nm for RhB/PVA films was observed and by adding DNA, a strong completely switchover from RSA to saturable absorption (SA) behavior. These data indicate that the addition of DNA has been resulted in higher transmittance and fluorescence efficiency as well as higher third order nonlinearity of the solid films. Therefore, concluded that DNA is a promising material for photonic applications. Also, observed that PVA is a good matrix for Rhodamine B dye that incorporated into the double helix of DNA molecule making them a suitable biomaterial for photonic devices.