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Modification induced by proton irradiation in Bayfol UV1 7-2 nuclear track detector

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Bayfol is a class of polymeric solid state nuclear track detector which has many applications in various radiation detection fields. It is a Makrofol polycarbonate/polyester blend. Samples from Bayfol film have been irradiated with different fluences (10^{11} – 10^{14} p/cm²) of 1 MeV protons at the University of Surrey Ion Beam Center, UK. The resultant effect of proton irradiation on the structural and optical properties of the Bayfol samples has been investigated using X-ray diffraction, Fourier Transform Infrared and UV spectroscopy. The optical energy gap was decreased from 4.24 to 4.03 eV with increasing the proton fluence from 10^{11} to 10^{13} p/cm², and was accompanied by an increase in the Urbach energy from 0.79 to 1.29 eV. This could be correlated to the results obtained from XRD and FTIR spectroscopy. Further, the non-irradiated Bayfol is nearly colorless. It showed significant sensitivity to color by proton irradiation, associated with an increase in the red and yellow color components. The variation of optical and color parameters with the proton fluence indicate that the dynamic range of Bayfol UV1 7-2 is in the fluence range from 10^{11} to 10^{13} p/cm².