UV-Vis spectral evaluation of CR-39 detector exposed with diagnostic dosage

ABSTRACT

The effects of the X-ray irradiation and chemical etching on the physical and optical properties of CR-39 plastic detectors were investigated for different doses of X-ray. CR-39 detectors were etched in the solution of the 3 M of NaOH after irradiation for revelations of the track. The tracks formed on CR-39 either by irradiated X-ray or due to the effect of environment. The changes in the thickness after exposed have significant decrease in 60 kVp and started to increase in range of 70 kVp up to 100 kVp due to the formation of oxidation layer on surface by free radicals. The optical band gaps before etching and after etching were determined by using Ultraviolet-visible (UV-Vis) spectroscopy. The optical band gap is attributed to the indirect transition due to its amorphous nature which is significantly decline trend energy in increase of the energy fluence of radiation. The Urbachôs energy, is defined as the width of the tail localized states in the forbidden band gap which change increment trend as increase in dose delivered due to the distortion structure of the CR-39 in terms of the electron charges in valences electron hence attributes to the induced modification of angle bond between the neighboring atoms.

Keyword: CR-39; Optical band gap; X-ray irradiation