

Effect of infrared laser on the activation energy of CR-39 solid state nuclear track detector

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Abstract

The effect of infrared laser of wavelength ($\lambda = 1064\text{nm}$), pulse energy of 40 mJ/pulse at a repetition rate of 10 Hz, on the activation energy of CR-39 solid state nuclear track detector has been investigated. Fifteen detectors were divided into three sets of equal numbers. The first set (post-exposed) was first exposed to alpha radiation with close contact to the ^{241}Am source and then treated in air with laser at energy intensity 8 J/cm^2 . For the second set (pre-exposed), the process was reversed (laser + alpha) under the same conditions. The third set (unexposed to laser beam) was irradiated in close contact with the same alpha source (^{241}Am). The activation energy of track etch (E_V) for post-exposed, pre-exposed and unexposed was found equal to 0.887, 0.914 and 0.671 eV, respectively. The respective activation energies of bulk etch (E_B) for post-exposed, pre-exposed and unexposed was found equal to 0.984, 0.912 and 0.926 eV.

From these measurements, it is concluded that the laser exposure led to the hardening of the material of the detector as evidenced from the values of activation energies for both bulk and track etch.