

CO₂ pulsed laser effect on CR-39 registration properties

F. Abu-Jarad, S.M.A. Durrani and M.A. Islam

Energy Research Laboratory, Research Institute, King Fahd University of Petroleum and Minerals, Dhahran-31261, Saudi Arabia

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The effect on alpha and fission fragment tracks of CR-39 nuclear track detectors exposed to a 10.6 μm CO₂ pulsed laser has been studied in the energy range 60 mJ/P to 2 J/P for different exposure times. It has been found that the surface structure did not change if exposed to energies below 180 mJ/P and for total energies up to 3600 J. The surface shows significant changes in terms of track sizes, shapes and chain-like structures when exposed to energies greater than 450 mJ, independent of the exposure time. The circular annealed central area around the laser pulses increased by increasing the energy/pulse from 1 J to 2 J/P, where the radius of the circular annealed area increased from 900 μm up to 3500 μm , respectively. Both alpha and fission fragment tracks disappeared from this area. From 450 mJ/P up to 1 J/P, only fission fragment tracks are annealed from the central area. Circular laser diffraction patterns appeared on the surface at energies > 450 mJ/P. The width of these diffraction patterns decreases with increasing distance from the center of the pulse. At the center of each diffraction pattern, chain structures appeared due to the high temperature of the laser and evaporation to a depth of 20 μm occurred.