Study on the Tracks in a Nuclear Track Detector (CR39) for a Laser-induced Charged Particle Detection at KAERI

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Abstract

In the experiments of laser-accelerated charged particles, a CR39 plastic is widely used to measure the flux as well as energy spectrum. It is inert and safe to handle. It is sensitive to charged particles, while insensitive to light, X-rays, γ-rays, electrons, and sea level cosmic rays. We also used TASTRAK (CR39) plastic of 50 x 50 cm^2 in size and 0.75 mm in thickness, manufactured by Track Analysis Systems Ltd at Bristol University, as a nuclear track detector. We investigated the growth of damaged tracks depending on the energy and incident angle of the laser-induced charged particles as well as the etching conditions. Polonium-210, which is a 5.4 MeV alpha source, was also used to calibrate the detection efficiency of the TASTRAK at the different etching condition of 6N NaOH.

We will present the optimized etching conditions for different experimental set-ups and the experimental results will be compared with a theoretical analysis.

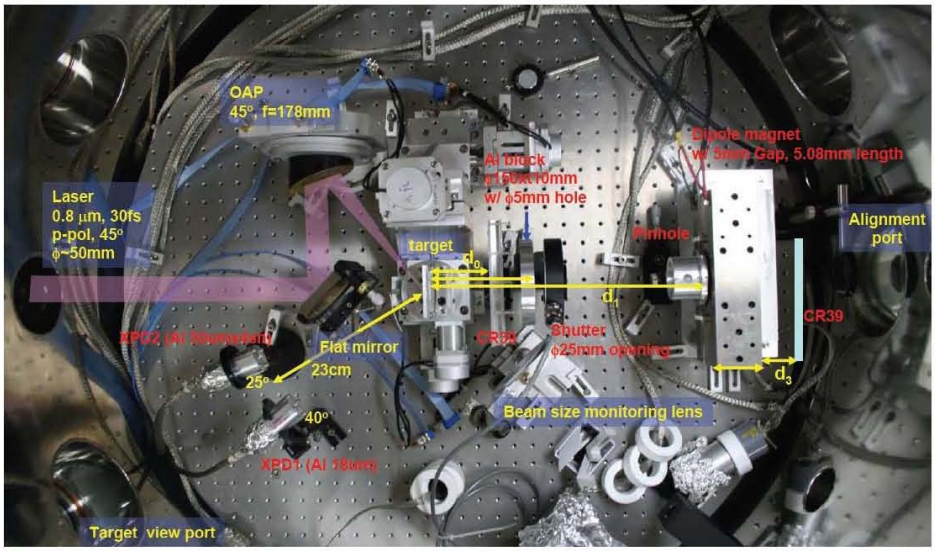

Figure 1. Experimental set-up for laser-accelerated ion generation

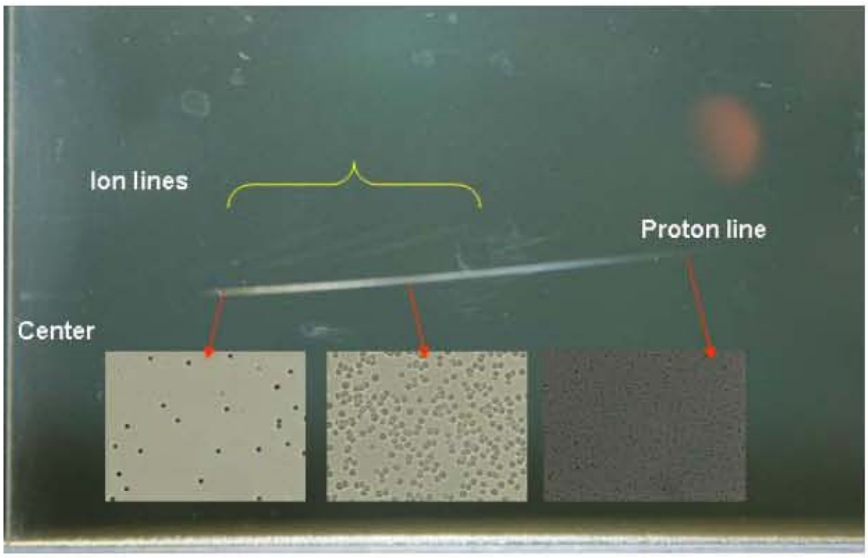

Figure 2. Tracks of ions in CR39 after a Thomson Parabola Spectrometer.

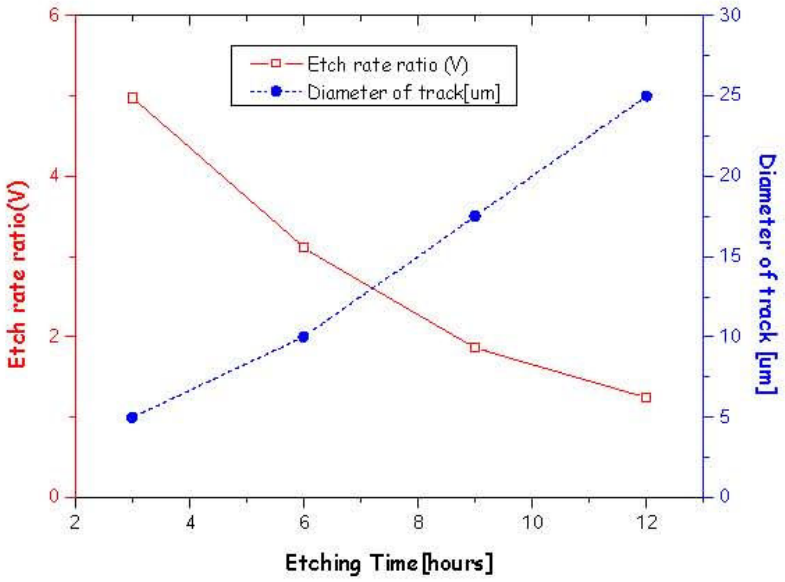

Figure 3. Etch rate ratio and track diameter of damaged tracks due to protons generated using 6 μm Polyester film.