

Morphology of latent and etched heavy ion tracks in radiation resistant polymers polyimide and poly(ethylene naphthalate)

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The initial phase of chemical etching of ion tracks was studied in the radiation resistant polymers polyimide (PI) and poly(ethylene naphthalate) (PEN). Stacks of thin films were irradiated with Kr, Xe and Bi ions with energies of several MeV per nucleon. During the etching process, the evolution of the pore growth was monitored by conductometric measurements. Similar to earlier observations in other polymers, the etching process revealed the existence of two different radial damage zones, namely, a track core and a track halo. Compared to the virgin polymer, the etching rate in the core region is largely increased, whereas the halo exhibits a higher resistance to the chemical attack indicating radiation-induced cross-linking effects. Typical diameter of the central part of the latent track is measured for different stopping powers of the projectiles. The track to bulk etch ratio is found to reach 500–600 in PI and ~10 000 in PEN. Due to this property, both materials seem to be suitable for producing micro- and even nanostructures with high aspect ratios.