

Heavy-ion induced modification of lithium fluoride observed by scanning force microscopy

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In order to study ion-induced damage in single crystals of lithium fluoride with scanning force microscopy (SFM), samples are irradiated with several heavy-ion species with kinetic energy of 11.4 MeV per nucleon. As concluded from a previous analysis of ion tracks in LiF by optical absorption spectroscopy and small-angle X-ray scattering, single point defects occur in a track halo with a radius in the range 15-30 nm, whereas defect aggregates are formed in a track core region possessing a radius of only 1-2 nm. These aggregates can be attacked by chemical etching if the energy loss along the ion trajectory surpasses a critical value of about 1 keV/Å.

SFM images of etched as well as unetched sample surfaces reveal new damage characteristics: etched ion-track profiles directed parallel to the ion trajectories exhibit a sequence of single etch pits with an average distance between them of about 140 nm. After exposure to heavy-ion irradiation at normal incidence, the unetched LiF surface is covered with round hillocks with a mean diameter of 55(8) nm and heights of the order of 3 nm.