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# Material modifications under extreme conditions delivered by swift heavy ions

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The slowing down of swift heavy ions in matter leads to the deposition of enormous energy to the electrons of a given target of the order of 1022 W/cm3. This presentation provides an overview of the present knowledge of ion tracks and material modifications induced by swift heavy ions of MeV to GeV energy. Track formation requires a critical energy loss threshold and shows a clear dependence on the material conductivity as well as on the velocity of the ions [1]. Track effects are investigated by a large variety of methods including direct track measurements such as electron microscopy or atomic force microscopy as well as indirect techniques such as small angle X-ray scattering, X-ray diffraction, Rutherford backscattering, Mössbauer spectroscopy, and infrared or Raman spectroscopy. Regarding theoretical approaches, the inelastic thermal spike model [2] is the most promising approach. It will be discussed how material sensitivity is influenced by the electron-phonon mean free path of the material and the radial energy deposition on the electrons.
[1] M. Toulemonde, W. Assmann, C. Dufour, A. Meftah and C. Trautmann Nucl. Instr. Meth. B 277 (2012) 28
[2] C. Dufour and M. Toulemonde Ser. Surf. Sci. 61 (2016) 63

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