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SIMULATION OF NANOFOAMS UNDER STRESS AND IRRADIATION CONDITIONS

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Abstract

High-porosity materials can be found in a number of situations, from space grains to reactor materials. Using molecular dynamics (MD) simulations, we analyze the case of high porosity foams, with pores at the nanoscale, where experimental techniques are difficult to use and interpret. We study the mechanical behavior of nanofoams under tension and compression, together with their evolution under irradiation. We consider to irradiation scenarios: (a) irradiation with ions with energies in the range 1-25 keV, of interest for fusion and fission energy applications; (b) swift heavy ion irradiation, with energies up to 5 GeV, relevant for track formation and interstellar grain evolution. Irradiation effects have larger spatial extent than for compact, full-density solids, and include the production of point-defects and twins which change the foam mechanical properties. In addition, we analyze the swift-heavy ion induced sputtering of these nanofoams.

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