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Mechanical stresses in solids irradiated with swift heavy ions: in-situ and postradiation examination

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Radiation defects produced by swift heavy ions are concentrated within small volume, surrounding ion trajectory. This inevitably results in generation of local mechanical stress, which in own turn may affect final defect structure. The knowledge about of such a high energy heavy ion track-assisted stress is of considerable practical value in view of simulation of fission product impact in radiation resistant oxides and ceramics, as candidate materials for nuclear waste management and prediction of their long-term radiation stability. In this report we give a review of experiments aimed at evaluation of mechanical stresses in radiation resistant ceramics (Al2O3, Si3N4, AlN) during and after irradiation with high energy Kr, Xe and Bi ions. To characterize stress a piezospectroscopic method, utilizing the relationship between the stress and changes in the ionoluminescence, photoluminescence and Raman spectra has been used.

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