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Ion-induced radiation damage in Lutetium-Aluminium and Gold using SRIM-2013

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The Monte Carlo simulation Code, Stopping Power, and Range of Ions in Matter (SRIM) has been effective among other binary collision approximation codes for estimating the level of damage produced due to ion irradiation in materials. This study estimated the level of damage by heavy and light-ion irradiation to Lutetium-Aluminium (Lu-Al) and gold materials with Au and proton ion implantation respectively using SRIM-2013 quick damage simulations. Lu-Al and Au have applications in reactor flux monitoring, advanced space, and collider systems. There has been growing evidence that protons and much more heavy-ion irradiation produces displacement damage effects comparable to that of neutrons on the microstructure of irradiated materials. Hence, this present study of the effect of light and heavy ion irradiation will contribute to the current understanding of ion irradiation in the materials of choice. Total damage in the materials was computed at the Primary Knock-on Atom (PKA) energies of 0.02, 0.1, 0.4, 0.5, 1.0, and 10.0 MeV. Damage profile results revealed that irradiation with Au-ions produced more damage to the materials than proton-ions at the same PKA energies. Also, the damage levels increased with increasing PKA energies. Frenkel pairs produced due to ion implantation in the Au material were also seen to be higher than in the Lu-Al Alloy.

Keywords: Ion-irradiation, microstructure, SRIM, proton, radiation damage.

Apply to be considered for a student ; award (Yes / No)?

Yes

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PhD

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