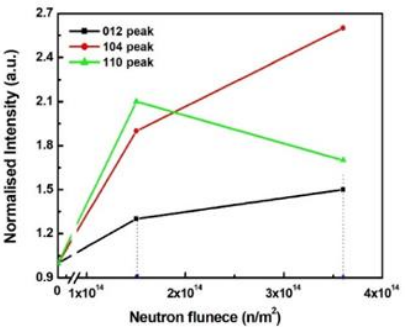
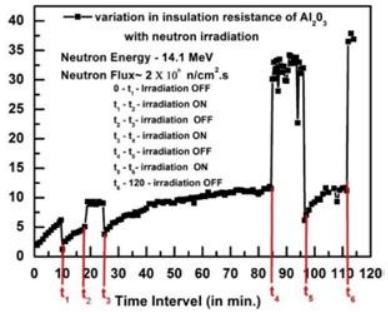
Neutron irradiation impact on structural and electrical properties of polycrystalline Al_2O_3

Sunil Kumar, Sejal Shah, S. Vala, M. Abhangi, A. Chakraborty





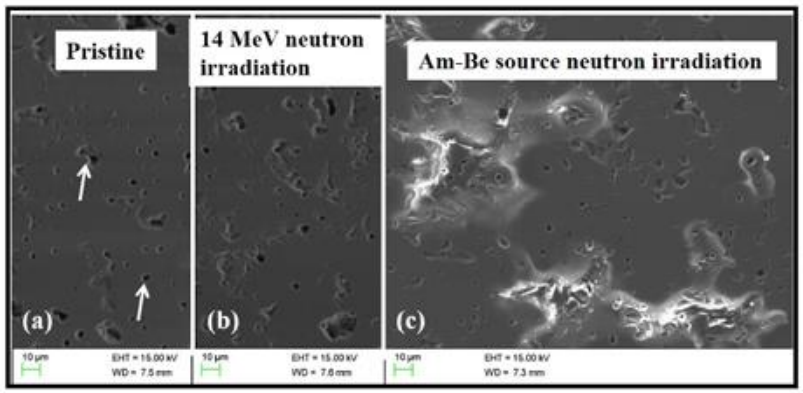


Figure caption: (i) Normalized intensity plot of XRD peaks at different neutron fluences used in the study (ii)In-situ IR measurement (iii) Surface morphology of pristine, 14 MeV and Am–Be neutrons irradiated Alumina

Structural and electrical behavior of polycrystalline Al_2O_3 in two different neutron environments (i) 14 MeV neutrons (ii) Am–Be neutrons with mixed energy spectrum is studied.

XRD results suggest an annealing effect in the case of 14 MeV neutron irradiation in Al2O3 which is responsible for improved structural behavior at lower fluence whereas, defect production was observed for Am–Be neutron irradiated samples, implying the different energy loss mechanism of neutron within material for two different neutrons energy regimes. Cluster formation are observed on the sample surface after prolonged Am–Be neutron exposure which is also responsible for observed damage. In-situ Radiation-induced conductivity variation during 14 MeV neutron exposure is studied. Quick recovery of RIC post-irradiation suggests, no radiation-induced permanent damage till the operating fluence of neutrons.

Nuclear Engineering and Technology Vol 56 (2024) 402
https://doi.org/10.1016/j.net.2023.10.010