Contribution ID : **23** Type : **Talk**

Development of a semi-empirical method to interconnect ion and neutron radiation-induced hardening in structural steels for nuclear applications using nanoindentation and crystal plasticity finite element method

Reduced activation ferritic/martensitic (RAFM) steels are the main candidates for the construction of structural components in future nuclear reactors. To ensure safe reactor employment, RAFM-based materials require efficient methods for their characterization under constant neutron irradiation. However, neutron irradiation for research purposes is an expensive and long process, and therefore a limiting factor to steadily investigate its effect. Hence, a safer and cheaper solution of ion irradiation as a tool to surrogate the neutron damage is becoming more and more popular. The presented study demonstrates a semi-empirical approach to effectively interconnect the ion and neutron radiation-induced hardening in RAFM steels. The applied set of tools, based on nanoindentation and tensile tests, as well as their finite element method simulations, allows us to extract the irradiation effect on the material law, and accurately reproduce the experimental data. Ultimately, the analysis performed on an ion-irradiated specimen can provide the macroscale (neutron irradiated) yield stress values in a range of dpa doses, which correlate with the literature.

Primary author(s) : KHVAN, Tymofii (NOMATEN CoE); MULEWSKA, Katarzyna (NCBJ/Nomaten); KURPASKA, Łukasz (National Center for Nuclear Research)

Presenter(s) : KHVAN, Tymofii (NOMATEN CoE)