

Damage accumulation in irradiated materials: influence on structural and functional properties

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Damage accumulation caused by irradiation with fast particles is definitively a key problem related to the design and exploitation of materials expected to be used in a radiative environment. A common axis for the description of the material response is the amount of damage created by irradiation in a given solid. However, the actual level of the disorder is often a nonlinear function of the created damage. The first aspect that will be addressed in the presentation will thus be a relation between created and residual damage. Several models of damage accumulation, from simple Gibbson approach to Multi-Step Damage Accumulation model will be shortly presented and discussed.

In the next part of the presentation the issues related to the quantitative measurements of the disorder level and characteristic structural changes caused by irradiation will be addressed followed by examples of the influence of radiation damage on functional properties of materials. Finally, main challenges related to the studies of future fission and fusion materials will be briefly discussed with the special emphasis to the list of experiments required for the qualification of a given material for the use in nuclear environment. The presentation will be finished with examples of the equipment needed to perform the above mentioned tasks.