

Consequences of neutron irradiation of fusion plasma-facing materials and components

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Plasma-facing materials and components are the interface between the fusion plasma and the reactor's material structure. In a burning fusion reactor, they are directly exposed to the neutrons from the D-T fusion reaction. Neutron-exposed materials undergo changes in their composition due to transmutation reactions, both towards light elements (H, He) and heavy isotopes. In addition, neutron-induced collision cascades displace atoms in the solid material. As a consequence, the first wall materials are not only activated, but also modified in their material properties, e.g. thermal conductivity. For some effects like the erosion by sputtering or hydrogen isotope retention, the consequences of neutron irradiation are not well known. In the fusion environment, the consequences of neutron irradiation need to be considered for the prediction of the lifetime of plasma-facing components, as this directly influences safety and the economy of a fusion reactor. This presentation will describe altered material properties and methods to study the behavior of first wall components after neutron irradiation.

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