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Bulk, surfaces, and grain boundaries in the lifetime of cascades

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Neutron irradiation is an engine in a fusion reactor that generates power, but not all that controllable. The uncontrollable nature of neutron in a magnetic field still needs to be controlled to some extent in order to safely operate the fusion power plant, and one of the potential solutions is to use a tough plasma-facing material. W as a plasma-facing material unavoidably has grains, and the durability of W under neutron irradiation is affected by microstructural properties such as grain size distribution.

In this talk, we compare and contrast the differences in defect population, evolution, and annihilation in the damage cascades in various environments, i.e. periodic bulk, near surface, or near grain boundaries, from atomistic calculations. In particular, we try to identify the origin of the kinetic characteristics in each environment, and how we can further improve the damage predictions from atomistic calculations to make them compatible and quantitatively consistent with experimental measurements.

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