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Simulation of Defects and Radiation Damage in Metallic Materials

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Message from the Guest Editor

Mechanical properties of metallic materials are fundamentally controlled by multi-defect interactions. In an otherwise defect-free crystal, the interactions between dislocations lead to dislocation substructure evolution and work hardening.

One way to induce defects in metallic materials is radiation. Irradiation process generates large amounts of various lattice defects, such as point defects, interstitial or vacancy clusters, voids, precipitates, stacking fault tetrahedra, prismatic dislocation loops, Frank loops, and helium bubbles.

Among the many efforts, modeling and simulations have played an important role. Relevant advanced numerical approaches include but are not limited to density functional theory, molecular dynamics/statics, Monte Carlo, cluster dynamics, CALPHAD, discrete dislocation dynamics, phase-field modeling, and the finite element method. In this Special Issue, researchers are encouraged to submit research articles or reviews on developing new numerical techniques or applying existing simulation tools toward a better understanding of defects and radiation damage in metallic materials.

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Message from the Editor-in-Chief

Metallic materials play a vital role in the economic life of modern societies; contributions are sought on fresh developments that enhance our understanding of the fundamental aspects related to the relationships between processing, properties and microstructure – disciplines in the metallurgical field ranging from processing, mechanical behavior, phase transitions and microstructural evolution, nanostructures, as well as unique metallic properties – inspire general and scholarly interest among the scientific community.

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