Special Issue

Radiation Damage in Materials: Coupled Extreme Environments

Message from the Guest Editors

Understanding radiation damage effects in materials used in complex real-world extreme environments has been an ongoing challenge for several decades. The complexity stems from not only the fundamental particle–solid interactions and the subsequent damage recovery dynamics after collision cascades, which involve a large range of both spatial and temporal length scales, but also the transmuted impurities that are unavoidable from accompanying nuclear processes (e.g., helium incorporation) and their interactions with both intrinsic and extrinsic defects through damage recovery and defect evolution processes. Adding to the complexity is the co-existence of other extreme environments (thermal, mechanical, chemical, etc.) that materials often face in addition to radiation and their synergistic effects on material performance. Whether it be in space applications or terrestrial nuclear power, the overlapping stressors created by these coupled extreme environments can result in deleterious and often unexpected failures. **Keywords**

- extreme environments
- radiation effects
- high temperature
- corrosion
- mechanical
- ion irradiation

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