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ANAHEIM CONVENTION CENTER & ANAHEIM MARRIOTT
ANAHEIM, CALIFORNIA, USA
#TMSAnnualMeeting

SUBMIT AN ABSTRACT FOR THE FOLLOWING TMS2022 SYMPOSIUM:

NUCLEAR MATERIALS

Synergistic Irradiation, Corrosion, and Microstructural Evolution in Nuclear Materials

All materials in nuclear reactor cores are simultaneously exposed to ionizing radiation and a corrosive environment: pressurized hot water in LWRs, molten salt in MSRs and liquid salt immersion blanket fusion reactors, liquid metal in LMFRs, etc. Both corrosion and irradiation can produce significant microstructural changes leading to degradation of material properties. These two phenomena are usually studied through a separate effect approach, which can be scientifically useful but practically limited since corrosion and irradiation happen simultaneously in the reactor, not without synergy.

Unfortunately, the coupled effects of irradiation and corrosion are not well understood, nor even well characterized. While irradiation can enhance/accelerate corrosion in some environments, it has been found to decelerate it in others. In any case, while corrosion can have different manifestations depending on the material and the corrosive medium, its kinetics and mechanisms can be affected by concomitant irradiation induced defects. Such coupled effects of irradiation and corrosion which are the focus of the Energy Frontiers Research Center FUTURE (Fundamental Understanding of Transport Under Reactor Extremes) are thus of special interest to this symposium.

In this symposium, we wish to assemble and highlight the relatively new and rapidly growing field of simultaneous irradiation and corrosion in nuclear materials. Similarities between corrosion mechanisms and how they are affected by radiation are expected to evolve, thus bringing together the experts in this field is expected to solicit scientific similarities and delineate descriptive differences between materials coupled with environmental degradation during irradiation.

Specific topics where contributions are encouraged include:

- Studies leading to a better understanding of corrosion mechanisms without irradiation in real or simulated nuclear environments (pressurized hot water, molten salt, liquid metal)
- Corrosion and oxidation of irradiated materials in similar environments
- Radiation damage in ceramic oxides to better understand the nature of defects in oxides, including modelling studies that help understand the properties of irradiation induced defects in oxides
- Finally, serial and simultaneous irradiation/corrosion studies enabling a better understanding of the synergy of irradiation and corrosion processes regardless of the corrosive medium

For all topics, in situ characterization and measurement techniques which probe the kinetics/mechanisms of corrosion coupled with irradiation, either in parallel or in series, are particularly welcome. Both experimental and theoretical/computational studies are solicited with particular emphasis on linking state-of-the-art modeling with experimental observations.

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QUESTIONS?
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