DOE NNSA SSGF, 2016 successful application

Intellectual Excitement:

How did you choose your area of research? Why is it an exciting area of study? (Please answer in no more than 300 words.)

My initial interest in the field of nuclear materials science stemmed from the knowledge that materials performance over time is the limiting factor in nuclear systems of all kinds. The context of this problem, as it was introduced to me, revolved around the resurgence of new nuclear development in the energy sector. For these systems there seemed to be two possibilities for high-dose material design: test traditional materials to increasingly higher doses to confirm their performance or develop new, radiation-resistant, materials. The growing need for some solution to the materials problem led me to choose the field of nuclear materials science for my doctoral work.

Personal narrative

One of the major limitations in designing and testing new materials for high-radiation environments is the reliance on traditional post-irradiation examination. Although this kind of testing has been utilized for decades, it often begins and ends with materials being tested in ambient conditions with neutron or ion exposure in between. This testing procedure will often record material properties that do not accurately reflect in-operando material properties. The presence of active point-defect generation can drastically change equilibrium properties such as void nucleation, precipitate formation, and order/disorder transitions to name but a few.

Specific research interest

I find the research that I am conducting particularly exciting because, for the first time, we should be able to measure material properties in-situ, in a non-destructive way, as they are being irradiated with particles heavier than electrons. By coupling this ability with the relative ease and flexibility of ion beam irradiation, first-order determination of favorable in-operando material performance can be greatly expedited. I am excited to be part of a project which, if successful, could play a meaningful role in future nuclear material testing.

Career goals