Investigator: Jian Wang

Position Title: Associate Professor

Department: Mechanical & Materials Engineering

Email: jianwang@unl.edu

Phone: (402) 472-2375

Webpage: http://engineering.unl.edu/faculty/jian-wang/

Structure-Properties-Functionalities of Irradiated Amorphous Ceramics

Abstract. Clearly radiation does interact on an atomic/molecular level with amorphous materials. The question becomes: exactly what are these interactions, and what are minimal changes in the materials observed? We **hypothesize** that radiation-induced damage in certain amorphous ceramics may be accommodated by local bond reconstruction/rearrangement and/or annealing of the damage faster than it is created, allowing these alloys to persist indefinitely in an externally driven steady-state with time-invariant structure, properties, and functionalities. **This NCESR program will test this fundamental hypothesis and use the results as the foundation for an EFRC**. The EFRC to be competed in next two years aims at structure-properties-functionalities relations of amorphous materials at extreme radiations and *transforming* such an understanding into a capability of designing radiation-tolerant amorphous materials. The proposed EFRC addresses two of the five grand challenges outlined in the recent BESAC report titled “Directing Matter and Energy: Five grand challenges for science and the Imagination”, and address two of the energy challenges described in the ten BES workshop reports in the Basic Research Needs series.

Based on the EFRC review criteria, we will link our goals with existing programs and expertise at UNL through this NCSER project, and use the NCSER seed funding to 1) exploit a few key relations of Structure-Properties-Functionalities of irradiated amorphous ceramics, that can link our existing work to develop a full proposal to DoE-BES programs, and 2) enhance the interdisciplinary scientific base at UNL to an EFRC level by closely integrating the theory/modeling/experiment expertise of our faculty. Finally, 3) we will develop proposals to the DoE-BES Core Program: Materials under Extreme Environments and the DoE-BES EFRC program.