

## MATERIALS ENGINEERING

### SEMINAR

#### “Unexpected Deformation Induced Martensitic Transformation in Ni-Superalloys”

By

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Purdue MSE PhD Dissertation

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#### ABSTRACT

The objective of this thesis is to characterize and explore deformation induced martensitic transformation (DIMIT) in Ni superalloys 625 and 690. DIMIT is first characterized experimentally and through molecular dynamics simulation in as received materials in the three low-index zone axes, then the influence of neutron irradiation to 1dpa at 400°C is investigated. In order to decouple the effects of dislocation loops and cavities, 2MeV proton irradiation to 1dpa at 500°C and a series of helium irradiations with energies ranging from 100-800keV to 1015 ions/cm<sup>2</sup> are conducted respectively. In all conditions, DIMIT is investigated using electron backscatter diffraction to identify grains of interest, nanoindentation to introduce plastic deformation, and high-resolution S/TEM to characterize the deformation microstructure. The results of this study will advance the understanding of deformation mechanisms in critical structural alloys for nuclear application, and better inform the design window for materials selection in advanced reactor systems.

**Date:** Friday, December 16<sup>th</sup>, 2022

**Time:** 9:00am

**Place:** ARMS 1028 or via WebEx

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