Graduate Student Research Seminar

Fall 2022

Microstructural damage measurement via a Heaviside function based algorithm and high resolution digital image correlation

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Monday, October 24th

3:00 pm (EST) – 132 Fluor Daniel Building

Abstract

The understanding of microstructural damage mechanisms is the foundation for better understanding existing materials and development of new materials. There are significant challenges to measuring these damage mechanisms in-situ as continuous observation of the state of the microstructure is difficult or impossible for many experimental setups. A Heaviside function based algorithm has been developed to measure these damage mechanisms that quantifies the magnitude of slip from high resolution digital image correlation (HRDIC) data. The slip magnitudes, orientations, and locations are compared to the microstructure of the specimen mapped by electron backscattered diffraction (EBSD) to analyze grain orientation and grain boundary location influence. The microstructure map is also used to differentiate between intragranular slip and grain boundary sliding in the analysis code. Ti-based multi-principal element alloys with a BCC crystal structure were used to develop the analysis code as they are theoretically vulnerable to both intragranular slip and grain boundary sliding, especially at elevated temperatures. Development of the analysis code is ongoing with additional features of grain rotation measurement and Schmid factor analysis in progress. A completed analysis code will provide an exceptionally thorough analysis of the microstructure relation to damage mechanisms in metallic materials in all types of mechanical testing.

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