FALL 2022

MSE 690 SEMINAR SERIES

FRIDAY, OCTOBER 14TH, 2022 | 3:30 - 5:00PM

ARMS 1010

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Oxidation and nonequilibrium microstructures:

The role of evolving nanoscale features in the progress and rate of oxidation

Abstract: Oxidation is a dynamic process that may result in significant solute segregation, pore evolution or other deleterious microstructural changes in parallel with the formation of oxide scales. What happens when you start with a microstructure that is far from equilibrium? The competing dynamics of microstructural evolution and oxidation give rise to some fascinating phenomenon that can be leveraged to design novel oxidation tolerant materials. Here we will present several vignettes in which we interrogate the role of elevated point defect populations, the stability of nanograin boundaries, and phase segregation at the nanoscale concomitant with oxidation. In both scenarios, the material systems of interest will begin with a high degree of disorder, either through the incorporation of planar defects or due to a large population of point defects that limit long range crystallinity in the as deposited state—both of which will eventually give rise to (re)crystallization events. We will explore methods for stabilizing the initial defect populations through doping/alloying strategies and how these strategies impact both the oxidation kinetics and the oxidation pathways using a suite of thin film deposition techniques and in situ electron microscopy observations.

Biography: Jessica A. Krogstad is an associate professor in the Department of Material Science and Engineering at the University of Illinois, Urbana-Champaign. She received her PhD in Materials at the University of California, Santa Barbara working with Prof. Carlos G. Levi and completed a postdoctoral at Johns Hopkins University with Prof. Kevin J. Hemker before joining UIUC in 2014. Her current research explores the interplay between phase or morphological evolution and material functionality in structural materials under extreme conditions. She is the recipient of a several awards including DOE Early Career Award, the ACerS Robert L. Coble Award for Young Scholars and the TMS Early Career Faculty Fellow Award.

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