Special Guest Lectures

Order-Disorder Phase Transformation in Ni-Cr Alloys

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Abstract:

Mechanical property degradation due to the disorder to order phase transformation is of potential concern for alloys based on the Ni-Cr binary system (e.g., 690), particularly in nuclear power applications where component lifetimes can exceed 40 years. In the present research, the disorder-order phase transformation has been studied in the Ni-33 at% Cr model alloy by a combined experimental and computational approach. The multiscale modeling framework utilizes grand canonical and kinetic Monte Carlo simulation techniques based upon density functional theory calculations to treat both the thermodynamic and kinetic aspects of the phase transformation. The simulation results are used to generate a simple model for the ordering kinetics based upon the Kolmogorov-Johnson-Mehl-Avrami equation. Experimental measurements of the change in lattice parameter as a function of aging time and temperature are obtained in order to assess the model accuracy.

Speaker's Bio:

Dr. Tucker earned her B.S. in Nuclear Engineering from the University of Missouri – Rolla. She attended graduate school at the University of Wisconsin – Madison as a Naval Nuclear Propulsion Fellow, where she received her M.S. and Ph.D. in Nuclear Engineering with an emphasis in Materials Science in 2008. After graduation, Dr. Tucker accepted employment at Knolls Atomic Power Laboratory (KAPL) in Schenectady, NY. At KAPL, Dr. Tucker has focused on the area thermal stability of structural alloys used in nuclear power systems. Her research efforts leverage both modeling and experimental approaches to gain fundamental understanding of embrittlement mechanisms in Fe- and Ni-based alloys.

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