DREXEL UNIVERSITY
Materials Science and Engineering
College of Engineering

Thermal Stability of AlxCoCrFeNi High Entropy Alloys (HEAs) under High Temperature Oxidation Environments Using an *in-Situ* TEM Approach.

PhD Thesis Proposal
April 30, 2019 9:00 am-11 am (Bosson 302)

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Abstract

The $Al_xCoCrFeNi$ family of high entropy alloys (HEAs) has received considerable attention due to its promising thermal, mechanical, and corrosion-resistant properties, make it widely suited for aerospace and marine applications. The main concepts behind establishing high entropy alloys was to promote formation of stable solid solutions, such as FCC and BCC structures due to the effect of high configurational entropy of these alloys. However, despite the unique core effects of these alloys, the growth of secondary phases during thermal ageing at intermediate and high annealing temperature has been frequently reported, attracting a particular attention concerning the alloy design in terms of structural properties and potential applications.

While thermal stability and oxidation resistance of HEAs has been widely studied recently, there is a little understanding regarding the effect of alloy composition on stability of single phase HEAs. This project seeks to develop an innovative HEA for high temperature environments. Thermal stability will be studied using in-situ TEM technique in conjunction with ex-situ TEM at temperature between 550 to 900 C. The oxidation resistance will be also studied in-situ in TEM in an oxygen-rich elevated temperature environment. By doing so, relationship between microstructural evolution and oxidation resistance will be established providing a foundation for predictive understanding of phase evolution, opening the window toward designing innovative alloys for various applications.