# SEMINAR SERIES

# Precipitation Hardening in High Strength Lightweight Mn and Al Steels

**THURSDAY, APRIL 25 | 4 P.M.| HILL HALL 202**


## Laura Bartlett
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Dr. Laura Bartlett is the Robert V. Wolf Endowed Professor of Metallurgical Engineering and the Foundry Educational Foundation Key Professor of Metal Casting at Missouri University of Science and Technology. She is the director of the Robert V. Wolf Educational and Research Foundry at Missouri S&T. Her teaching and research experiences are in the areas of process and physical metallurgy of iron and steel casting alloys. Some of her research interests include inclusion engineering and solidification phenomena in high strength steels, the experimental and theoretical aspects of phase transformations, microstructure-mechanical property relationships in high strength alloys, and the development of advanced high strength and lightweight steels. Laura graduated with her BS and PhD in metallurgical engineering from Missouri S&T in 2008 and 2013, respectively. She is the recipient of the 2016 TMS-AIME Champion H. Mathewson Medal Award and the 2016 TMS Extraction and Processing Division Young Leader Award. She is also a three-time recipient of the AIST Kent D. Peaslee Junior Faculty Award and now holds the title of AIST Foundation Steel Professor. In addition she has won several best paper awards on the subject of advanced steel research including four AFS best paper awards in the steel technical division and the 2019 Richard J. Fruehan Award from AIST.


High manganese and aluminum steels are being considered as high strength and lightweight replacements for heavier low alloy steels in ballistic armor and in the transportation and mining industries. Aluminum additions up to 12wt.% contribute to a reduction in density up to 18% when compared with quenched and tempered Cr and Mo steels. Adding aluminum and carbon also enables these steels to be precipitation hardened by the formation of kappa carbide. This provides a high amount of strengthening but reduces the fracture toughness. Therefore, knowledge of how alloying elements and impurities affect the age hardening kinetics and corresponding microstructure mechanical property relationships is of great importance. In the current study, the influence of silicon and phosphorus on the precipitation of kappa carbide and corresponding mechanical properties was investigated using a combination of electron microscopy, XRD, atom probe tomography, and ab initio calculations.


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