

The Oak Ridge Chapter of ASM presents:

## **Student Travel Award Winners**

Melanie Buziak and Serena Beauchamp

**Thursday October 14th, 2021 (7:00 PM ET, 6:30 PM Social)**

**Virtual Event via RingCentral**

<https://meetings.ringcentral.com/j/1463671039?pwd=MkI2RVRCQ28rbk5rWUluTFFTMHovQT09>

Password: 300212



### **Melanie Buziak**

Graduate Student, University of Tennessee Knoxville

### **Solidification Behavior of Additively Manufactured Martensitic Precipitation- Hardenable Stainless Steels**

**Abstract:** The solidification conditions found during additive manufacturing (AM) of metallic alloys leads to compositional heterogeneity, non-equilibrium phase formation, and disparate microstructure that produces material properties unlike those of their wrought counterparts. This is particularly apparent in martensitic precipitation-hardenable stainless steels (PH-SS), where small variations in solidification conditions leads to changes in primary solidification phase (austenite or  $\delta$ -ferrite), a transition from columnar to equiaxed grain morphology, and different solid-state transformations caused by the cyclic heating/cooling cycles of AM. This work aims to understand the mechanisms of the solidification behavior of laser powder bed fusion (L-PBF) 17-4 PH-SS through the optimization of chemistry powder feedstock and manipulation of processing parameters. Chemistry variation from gas atomization allows for the identification of some critical N<sub>2</sub> content that stabilizes/prevents retained austenite in the as-built microstructure. The role of processing parameters on solidification behavior is explored to produce efficient post-build thermal processing or improved mechanical performance of L-PBF 17-4.

**Speaker Bio:** Melanie Buziak is a second-year master's student at the University of Tennessee in the Phase Transformations group and is advised by Dr. Eric Lass. She studies the solidification behavior of additively manufactured martensitic precipitation hardenable stainless steels. Upon completion of her masters, she will be pursuing her PhD at UT. She has been involved with ASM since her Junior year of college and was inducted into ASM's Inclusion, Diversity, Equity, and Awareness Committee in the Fall of 2020.



## **Serena Beauchamp**

Graduate Student, University of Tennessee Knoxville

### **Qualification Pathways for Additively Manufactured Components for Nuclear Applications**

**Abstract:** This research paper evaluated three pathways for qualification of 316 L stainless steel components made by laser powder bed fusion (L-PBF) additive manufacturing (AM). Comprehensive and consistent process flows with computational modeling, in-situ measurements, ex-situ characterization and mechanical testing with simple and complex geometries were explored. The role of post-process hot isostatic pressing (HIP), and solution anneal treatment were evaluated. By using HIP, the scatter in 316 L steel AM properties within single and complex components was minimized to meet the requirement of existing industry standards. For applications where HIP may not be feasible and with some extent of defect tolerance, alternative qualification methodologies of deploying L-PBF AM parts were also explored with samples made with and without engineered porosities. The data generated in this research will be relevant to deployment of AM components for emerging nuclear energy applications.

**Speaker Bio:** Serena Beauchamp (Bee-chum) is a first year PhD student in Material Science and Engineering at the University of Tennessee, Knoxville. She received her Bachelor's in MSE this past December. She is currently advised by Dr. Eric Lass and Dr. T. G. Nieh where she is studying the microstructural evolution of a series of high entropy alloys. She has also worked with additively manufactured stainless steels which will be her topic of discussion today.

#### **Virtual Meeting Details:**

- PC, Mac, Linux, iOS or Android:

<https://meetings.ringcentral.com/j/1463671039?pwd=MkI2RVRCQ28rbk5rWUluTFFTMHovQT09>

Password: 300212

**Date:** Thursday October 14th, 2021

**Schedule:**

6:30pm – virtual meeting opens / social hour

7:00pm – feature presentation

**Cost:** **FREE** for all attendees

- Or iPhone one-tap :

US: +1(470)8692200,,1463671039# (US East)  
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+1(773)2319226,,1463671039# (US North)  
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+1(213)2505700,,1463671039#  
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- Or Telephone:

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