**Materials Seminar**

Department of Materials Science & Engineering

# Thursday March 22, 2018

3:30 – 4:30 ~ 307 SERF

Faculty Candidate

"Exploration of Nano-scale Instability and Its Effect on Microstructural Evolution in Titanium Alloys using Advanced Characterization Technique and Computational Simulation"

**Speaker:** **Dr. Yufeng Zheng**



Center for the Accelerated Maturation of Materials-

The Ohio State University

Abstract:

Phase transformation and microstructural evolution in the metastable beta titanium alloys have attracted much attention. Compared with conventional microstructures in alpha/beta Ti alloys, typically involving fairly coarse lamellae of the alpha phase in either the colony or basketweave arrangement, depending on heat treatment conditions, various size scales of refined intragranular alpha microstructures can be produced in metastable beta Ti alloys. In this research, three different size scales of alpha microstructure, termed refined alpha, more-refined alpha and super-refined alpha microstructures, have been characterized in the same metastable beta Ti alloy, Ti-5553. These various distributions have been produced by exploiting the influences of nano-scale compositional and/or structural instabilities on the beta to alpha transformation, using various non-conventional transformation pathways. For example, the pre-formed, nano-scale, isothermal omega particles have been found to assist the subsequent formation of super-refined distribution of alpha precipitates with additional driving force by altering the local structure and composition, using abberation corrected S/TEM and phase field modeling. Recently, with the development of the atomic resolution z-contrast high angle annular dark field- scanning transmission electron microscopy, two types of novel nano-scale instabilities were characterized in beta titanium alloys for the first time, namely O' phase and O" phase, that could provide new insight of stress induced martensitic transformation and explain some unique properties in the gum-like titanium alloys. The transformation mechanism, a novel {110}<1-10> type soft-phonon, involved in O' phase will be discussed. Transformation sequence including omega phase, O' phase and O" phase in beta titaniums alloy will be introduced.

Biography:

Yufeng Zheng is a research associate in the Center for the Accelerated Maturation of Materials at the Ohio State University. He obtained his PhD degree majoring in Materials Science and Engineering from the Ohio State University in 2013. Yufeng’s research is focusing on the study of non-conventional phase transformation mechanisms involving nano-scale structural and compositional instabilities in titanium alloys utilizing the advanced electron microscopy and computational simulation. Yufeng implanted systematic investigations on the refinement of intragranular alpha microstructure in beta titanium alloys and proposed two novel phase transformation pathways in titanium alloys. He has also characterized and interpreted another two types of previously unidentified nano-scale metastable phases in titanium alloys, showing promising opportunities to improve the overall performance of titanium alloys by manipulating microstructural evolution. Yufeng has published 26 papers, two of which were recognized as highly cited paper by Web of Science, and presented talks over 20 times in the international conferences. He was named among five finalists of Aaronson Award in the International Conference on Solid-Solid Phase Transformation in Inorganic Materials for outstanding young researcher in 2015. Yufeng is a member of TMS phase transformation committee and TMS titanium committee. He has organized and chaired symposiums in the field of phase transformation in various international conferences.