UCI Samueli School of Engineering | Department of Mechanical and Aerospace Engineering

Seminar Series

Developing Strong and Tough Multiple Principal Element Alloys for Structural Applications at Elevated Temperatures

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Friday, April 05 2024 – 10:30 am
McDonnell Douglas Engineering Auditorium (MDEA)

Abstract: The development of stronger and tougher materials serving under extreme conditions is a long-term goal of materials research that has been made even more urgent recently by our quests for space exploration, air transportation, and energy sustainability. Recently, the advent of the multi-principal element alloys (MPEAs), also known as high entropy alloy, compositionally complex alloys, etc., has brought forth vast opportunities for the discovery and design of new materials with unprecedented mechanical properties that can meet the engineering requirements for these applications. This seminar navigates the scientific frontiers of MPEAs applied under high temperatures: 1. The deformation mechanisms of single-phase FCC and BCC MPEAs above 0.4 Tm (melting temperature); 2. The loss of strength for CrCoNi-based FCC MPEAs at intermediate temperatures and its remedies using additive manufacturing and oxide dispersion strengthening to surpass current Ni-based superalloys; and 3. The prospects and limitations of high-temperature, high-strength BCC refractory MPEAs to develop next-generation jet propulsion materials. These fundamental investigations demonstrate how the combination of dedicated mechanical testing and state-of-the-art characterization can advance the understanding and development of these highly complex alloys.

Bio: Dr. Mingwei Zhang is an assistant professor in the Department of Materials Science and Engineering at UC Davis. He completed postdoctoral training at the National Center for Electron Microscopy, Lawrence Berkeley National Laboratory under the supervision of Prof. Andrew Minor. He obtained his Ph.D. degree from the University of California, Davis in 2021. His primary research focuses on the mechanical properties and deformation mechanisms of multiple principal element alloys under extreme conditions combining advanced processing, bulk and in-situ mechanical testing, and advanced characterization techniques.