



College of Engineering
Department of
Mechanical & Industrial Engineering

The Robert W. Courter Seminar Series

3:00-4:00pm, Friday, October 3, 2025

1202 Patrick F. Taylor Hall



Microstructures and Deformation in Transitional Metal Carbides

by Dr. Gregory B. Thompson

**Distinguished University Research Professor and
the Executive Director for the Alabama Materials
Institute at The University of Alabama**

Abstract: Transitional metal carbides comprise a class of ultrahigh-melting-temperature materials that can form a myriad of microstructures depending upon the carbide type and phase fraction. Consequently, they exhibit a range of mechanical responses. For example, a high fraction of the zeta-phase tantalum carbide promotes a fracture toughness that places it into the “steel ceramic” category. In other cases, these carbides reveal an anomalous increase in hardness with decreasing carbon content in some, but not all, rock salt carbide structures. This seminar will address the underlying phase stability behavior in these unique carbides, how crystallography controls microstructure, their phase-dependent deformation mechanisms, and how the microscale connection between phase and mechanisms regulates mechanical performance. Distinct means for mechanical testing, including pseudo-single crystal fracture testing and non-contact thermal mechanical loading upwards of 3000 °C, will also be addressed.

Biography: Professor Gregory B. Thompson joined the faculty in the Department of Metallurgical & Materials Engineering at The University of Alabama as an Assistant Professor in 2003. He was tenured and promoted to Associate Professor in 2008 and promoted to Professor in 2012. In 2018, he was appointed Distinguished Research Professor for the UA system. He served for more than a decade as the Director for the Interdisciplinary Materials Science PhD program housed in the UA Graduate School, where he quadrupled the enrollment to over forty students during his administrative tenure. He is now the founding Executive Director for the Alabama Materials Institute (2023), one of four university-wide strategic research investment areas, with nearly 90 affiliated faculty across twelve different departments. The institute has eleven full-time staff members and maintains user facilities in analytical instrumentation as well as powder processing and additive manufacturing in support of materials characterization and fabrication research. Professor Thompson has published nearly 300 peer-reviewed articles in his research areas of analytical microscopy and phase transformations and has graduated 16 M.S. and 29 Ph.D. students to date. He received his Ph.D. (2003) and M.S. (1998) from The Ohio State University in Materials Science & Engineering and a B.S. (1996) in Physics from Brigham Young University. Between his M.S. and Ph.D., he worked as a processing coating engineer. He was awarded UA's Blackmon-Moody Outstanding Professor of the Year in 2014, the TMS Brimacombe medalist in 2017, and became a Fellow of the International Field Emission Society (atom probe tomography) in 2025.