THE MATERIALS SCIENCE AND ENGINEERING
SPRING 2026 COLLOQUIUM SERIES PRESENTS:

Professor Olivia Graeve

Professor and Director of Materials Science and Engineering
Professor of Mechanical and Aerospace Engineering
University of California – San Diego

Materials for Extreme (and Space) Environments: Crystallography and Properties

The idea of living on Mars has been a staple of science fiction since the 19th century. However, conditions make living on Mars extremely challenging. Materials needed for such extreme environments need to be discovered and designed. In this talk, we will present an overview and current research on carbide and boride materials for potential uses at extreme environments, including ultra-high and ultra-low temperatures, impact, and radiation. A significant focus will be placed on doped tantalum carbide (TaC) and similar materials. Specifically, a discussion on transition metals (Co, Ni, Ti) during a solvothermal synthesis process to control TaC nanoparticle shape will be presented. By using transition metals as dopants, faceted nanoparticles with reduced oxide content have been achieved. Imaging has shown that metal dopants promote faceting, enabling tighter particle packing and refined microstructures. These results demonstrate how doping changes nanoparticle shape, potentially enhancing the viability of TaC for demanding high-temperature engineering applications.

Prof. Olivia A. Graeve joined the University of California San Diego in 2012 and is currently the Elias Masry Endowed Professor in the Department of Mechanical and Aerospace Engineering, Director of the *CaliBaja Center for Resilient Materials and Systems*, and Director of the Program in Materials Science and Engineering. She holds a Ph.D. in Materials Science and Engineering (2001) from the University of California, Davis, and a Bachelor of Science degree in Structural Engineering (1995) from the University of California San Diego. Her area of research focuses on the design and processing of new materials for extreme environments. Prof. Graeve has been involved in many activities related to the recruitment and retention of women and underrepresented minority students in science and engineering and has received several prestigious awards including the Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring in 2020. She has been inducted into the Tijuana Walk of Fame (2014), the Mexican Academy of Engineering (2016), the Mexican Academy of Sciences (2019), the Latin American Academy of Sciences (2022), and has been named Fellow of the American Ceramic Society (2017) and of the American Association for the Advancement of Science (2021).

Tuesday, May 26 • 4 pm CT • Tech L211

In person only; no Zoom

Questions? Contact allison.macknick@northwestern.edu

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