



**Department of
Mechanical Engineering
The University of Hong Kong**



SEMINAR

Title: In-Situ Nanomechanics of Refractory Transition-Metal Carbides

Speaker: Professor Jenn-Ming Yang
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Date: December 3, 2024 (Tuesday)

Time: 11:00am

Venue: Room 734 & 735, Haking Wong Building

Abstract:

Refractory carbides of transition metals (e.g., Zr, Ta and Hf) exhibit a unique combination of high hardness, high elastic moduli, excellent wear resistance, and good resistance to ablation and corrosion due to their mix of ionic, covalent, and metallic bonding. These characteristics make them highly suitable for applications in environments involving high temperatures, chemical reactivity, and intense radiation, including in structural, energy, and semiconductor fields. However, despite their hardness, their use in structural applications at low temperatures has been limited by their brittleness. The design of refractory carbides that combine high hardness with enhanced ductility has been a long-standing challenge. Here, we present a brief review of our findings from *in-situ* observations of mechanical deformation in single crystals of transition-metal carbides (such as ZrC, TaC, VC and SiC) during uniaxial compression, observed directly inside a TEM. Density function theory calculations were also conducted to identify the most energetically favorable slip systems and the mechanisms governing the plastic deformation. Our studies offer new insights into the deformation mechanisms of these materials and identify potential strategies for enhancing their room-temperature plasticity.

Biography:

Professor Jenn-Ming Yang is the Distinguished Collins Aerospace Chair of Excellence in Aerospace Technology in the Department of Materials Science and Engineering at UCLA. Since 2013, he is also the Associate Dean and faculty director of the Engineering MS Online (ranked #1 by the USN&WR) and Master of Engineering programs at the UCLA Henry Samueli School of Engineering and Applied Science. He received his B.S. degree in Materials Science and Engineering from National Tsing Hua University and his Ph.D. in Applied Science-Metallurgy from the University of Delaware in 1986. Professor Yang joined the Department of Materials Science and Engineering at UCLA in 1986. He has received several awards, including the Presidential Young Investigator Award from the National Science Foundation and the R&D 100 Award. Professor Yang has over 35 years of experience in research and teaching and is an international recognized expert in the development of lightweight structural materials for aerospace structural and propulsion applications.

ALL INTERESTED ARE WELCOME

For further information, please contact Prof. Xiaobo Yin at 3910 2659.