Department of Mechanical Engineering The University of Hong Kong

DEPARTMENT OF MECHANICAL ENGINEERING THE UNIVERSITY OF HONG KONG

SEMINAR

Title: **Irradiation Induced Microstructure of Zr-alloys using the synergy of Electron microscopy and Diffraction**

Speaker: **Prof. Tamás Ungár**
Eotvos University Budapest, Budapest
Hungary

Venue: **Inno Wing Two**
HKU

Date: **May 6, 2025 (Tuesday)**

Time: **2:30pm – 3:30pm**

Abstract:
Structural materials in the nuclear industry operate within harsh environmental conditions. Cooling substances pose corrosion, irradiation produces a high density of lattice defects, and external strains cause fracture. The large density of lattice defects generated by irradiation causes embrittlement, leading to early fracture. The synergy of Electron Microscopy and Diffraction experiments have been used to characterize the quantity, nature, and size distribution of dislocation loops induced by proton or neutron irradiation [1-3]. In [1] it was shown that at lower irradiation temperatures the irradiation induced loops are smaller with larger densities. The apparent discrepancy between TEM and Diffraction results was used to determine the size distribution of irradiation-induced loops. In [3], a method was developed to determine the partial dislocation densities and the fractional activities of different slip modes in plastically deformed and neutron-irradiated Zr alloys. It was shown that irradiation totally eradicates lattice dislocations produced by the fabrication procedure in structural components. In post-irradiation tensile deformed Zr alloys the combined TEM, DIC and Diffraction results revealed extreme strain localisation.

[1] M. Topping et al., The effect of irradiation temperature on damage structures in proton-irradiated zirconium alloys, J. Nucl. Mater. 514 (2019) 358-367.
[2] T. Ungár et al., Size-distribution of irradiation-induced dislocation-loops in materials used in the nuclear industry, J. Nucl. Mater. 550 (2021) 152945-10.
[3] T. Ungár et al., Fractional densities and character of dislocations in different slip modes from powder diffraction patterns, J. Nucl. Mater. 589 (2024) 154828-16.

Biography:
PhD in 1980 at the Eötvös University Budapest in Hungary. Postdoctoral fellow as Humboldt stipend holder at the Max-Planck-Institute of Metallforschung in Stuttgart Germany in the group of Dr M. Wilkens and Prof. A. Seeger. 1988 Dr of Science (DSc) title issued by the Hungarian Academy of Science. Full professor at the Materials Science Department of the Eötvös University Budapest in Hungary. PhD on GP zone formation in Al-base alloys. Discovery of the characteristically asymmetric X-ray line broadening, direct evidence for the long-range internal stresses in heterogeneous dislocation structures. Since 1980 working on high-resolution diffraction line broadening. 2007 the Hanawalt award given by ICDD for the dislocation model of strain anisotropy. In 2008/2009 Humboldt Research Prize for working at different institutes in Germany. Seven years in Manchester, UK between 2016 to 2022. Visiting professor at the Materials and Engineering Department of the University of Manchester. Over 240 research papers, more than 22.000 citations, H-index 73 (Google-scholar).

ALL INTERESTED ARE WELCOME
For further information, please contact Prof. Mingxin Huang