Decoding Plastic Deformation Via High-Energy X-ray Diffraction

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zoom: https://wpi.zoom.us/j/93538117042

Abstract

Understanding plastic deformation in metals and alloys requires observing microstructural processes as they occur — something that conventional laboratory techniques often cannot capture in sufficient detail. This talk aims to highlight why and how large-scale research facilities provide unique advantages for studying deformation mechanisms in structural materials.

Using the example of nitrogen's influence on stacking fault energy (SFE) and the resulting changes in predominant deformation modes such as dislocation slip, twinning, and phase transformations, I will discuss how (in-situ) synchrotron and neutron diffraction can directly reveal the evolution of microstructure under load.

Beyond presenting scientific results, the talk will emphasize practical aspects of conducting experiments at large-scale research facilities — from experimental design and data acquisition to data analysis. The overarching goal is to demonstrate how large-scale facilities can be of help to understand materials performance.

Bio

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Konstantin Werner is a materials scientist whose research focuses on the relationship between mechanical properties and plastic deformation mechanisms in metallic materials. He combines computational modeling and experimental approaches to understand how microstructural processes such as slip, twinning, and phase transformations govern strength and ductility.

He obtained both his PhD and MSc degrees from the Technical University of Denmark (DTU), where he studied deformation behavior in advanced alloys. Currently, he is a postdoctoral researcher at Université Grenoble Alpes (UGA), working on microstructural evolution in immiscible high-entropy alloy systems.

Konstantin is also passionate about mentoring young scientists and promoting the use of large-scale research facilities for materials characterization, encouraging the next generation to harness cutting-edge experimental tools for fundamental and applied research.