CRC/TRR 270

HoMMage

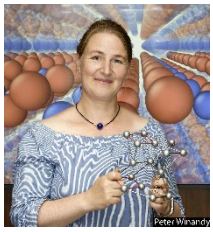
TECHNISCHE UNIVERSITÄT DARMSTADT

UNIVERSITÄT DUISBURG ESSEN

Offen im Denken

Hysteresis Design of Magnetic Materials for Efficient Energy Conversion

Tuesday, 24 October 2023, 9:00 s.t., TU Darmstadt, in Person and via Zoom



Prof. Dr. Sandra Korte-Kerzel

Faculty of Georesources and Materials Engineering

RWTH Aachen

Elucidating plastic deformation mechanisms for materials design

Abstract:

At the Institute of Physical Metallurgy and Materials Physics (IMM) in Aachen, our research is focused on gaining deeper insights into the underlying physical mechanisms governing the deformation of intermetallic and metallic materials as well as their composites. We investigate this across multiple scales, ranging from the atomic structure of intermetallics to the formation of micrometer-sized pores and cracks in steels during the forming process.

In this presentation, I will introduce three key topics:
Starting at the atomic scale, we characterize and model plasticity in intermetallic crystals and aim to understand the underlying mechanisms, which can be very different from metals, and identify new descriptors of plasticity. In the future, we thereby hope to offer improved guidance for identifying phases that exhibit the desired balance of high hardness and adequate toughness or allow defect engineering in functional intermetallics.

Ultimately, this will require a more powerful defect and materials design framework within CRC 1394 we aim to integrate materials design by defect engineering and phase stability. Using so-called 'defect phase diagrams', we intend to comprehensively consider defects, such as dislocations or grain boundaries, in terms of their atomic structure, chemistry, and thermodynamic stability.

Moving to the larger scale of entire dual phase microstructures with soft and hard phases, our research also involves leveraging machine learning techniques to analyze damage mechanisms during deformation. The inherent heterogeneity at various scales necessitates a combined approach of high-resolution and large-area observation using electron microscopy. This approach prompts us to re-evaluate and enhance the rigor with which we analyze and interpret our data.

About the speaker:

: Prof. Sandra Korte-Kerzel is head of the Institute of Physical Metallurgy and Materials Physics (IMM) and holds the Chair of Materials Physics at RWTH Aachen University. After her studies in Aachen, Christchurch (NZ) and Cambridge (UK), she was Junior Professor of Micromechanics of Materials at FAU Erlangen-Nürnberg before coming to Aachen in 2013. She is spokesperson of the Collaborative Research Centre SFB 1394 'Structural and Chemical Atomic Complexity – From Defect Phase Diagrams to Material Properties' and was awarded an ERC Starting Grant in 2019 on 'Fundamental Building Blocks – Understanding plasticity in complex crystals based on their simplest, intergrown units' (FunBlocks).