

## VIRTUAL SEMINAR Thursday, 04.03.2021 at 13:00

## Congruent and non-congruent grain boundary phase transformations in Copper studied by advanced STEM

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Recently, it has been revealed by atomistic simulations that grain boundaries can undergo congruent or non-congruent phase transformations leading to changes in material properties such as grain boundary diffusion. Congruent grain boundary phase transformations, which lead to a change in atomic arrangement of grain boundary atoms, and non-congruent grain boundaries phase transitions like segregation induced faceting are at the atomic scale experimentally largely unexplored. The excellent resolution of aberration corrected scanning transmission electron microscopy (STEM) provides direct access to the atomic structure of grain boundaries and their chemistry. In our studies, we analyze grain boundaries forming in thin Cu films grown on (0001) alpha Al2O3 substrates and their transitions in Cu. Furthermore, Bridgeman grown Cu bicrystals were alloyed with Ag to promote chemically driven grain boundary transitions.

In all cases grain boundary phase transitions or coexistence of two phase at the same grain boundary were observed. The structure motifs are discussed and compared to computational modelling. Strategies to determine experimentally whether grain boundary phases also impact material properties will be reported.

Acknowledgements: N. Peter, T. Meiners, J. Duarte, H. Bishara, C. Liebscher and T. Frolov are gratefully acknowledged for their scientific contributions. Part of this research has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (grant agreement No 787446; GB-CORRELATE).

Kindly invited.



K7 / Department for Nanostructured Materials

Gerhard Dehm is scientific member of the Max-Planck-Society, director at the Max-Planck-Institut für Eisenforschung GmbH in Düsseldorf and professor at the Ruhr-Universität-Bochum. From 2005 to 2012 he was head of the department Materials Physics at the Montanuniversität Leoben (Austria), and in addition managing director of the Erich Schmid Institute of Materials Science of the Austrian Academy of Sciences. Gerhard Dehm received an Alexander von Humboldt postdoc scholarship and spend 2 years as a guest scientist at the Technion in Haifa. Gerhard Dehm has published more than 340 publications on different aspects of materials science and engineering in renowned international journals (e.g. Nature, Science; Nature Materials, Nature Com., Advanced Materials, Phys Rev. Let., Acta Mater.) Special focus in his research is laid on advanced S/TEM and in-situ microscopy of interfaces, their structure, chemistry, stability, and impact on material properties. A further cornerstone of his research is small scale mechanical testing to provide fundamental understanding of local mechanical properties of materials. His recent ERC Advanced Grant, the highest research award of the European Union with 2.5 Mio €, revolves around grain boundaries in alloys, their chemistry and structure including grain boundary phase transitions, and their impact on materials properties.

