MM 57: Phase Transformations III

Time: Thursday 11:45–13:00 Location: C 230

MM 57.1 Thu 11:45 C 230

Elastic precursors of the martensitic phase transition in compositionally complex NiCoMnTi alloys — David Koch[1], Benedikt Beckmann[1], Franziska Staab[1], Oleh Ivasko[2], Martin von Zimmermann[2], Karsten Durst[1], Oliver Gutfleisch[1], and •Wolfgang Donner[1] — [1]Institute of Materials Science, Technical University of Darmstadt , 64287 Darmstadt, Germany — [2]Deutsches Elektronen-Synchrotron DESY, D-22607 Hamburg, Germany

Elastic precursors, such as elastic constants and phonon softening, leading to the martensitic phase transition, are of fundamental interest in understanding the mechanism behind a martensitic phase transition. This phenomenon has been extensively studied, for instance, in p-metal-containing Heusler alloys, where phonon softening along the [110] direction is commonly observed. The compositionally complex all-d-Heusler alloy NiCoMnTi exhibits a martensitic phase transition similar to p-metal Heusler alloys, even in the absence of a p-d hybridization. By studying temperature-dependent thermal diffuse x-ray scattering in single crystals, we have investigated these elastic precursors. The results shed light on the mechanism of the martensitic phase transition in all-d-Heusler alloys.

MM 57.2 Thu 12:00 C 230

Resistometric determination of GP-zone formation and growth — •Fabian Miller, Johannes Berlin, and Ferdinand Haider — Universität Augsburg, Institut für Physik, 86135 Augsburg

Natural ageing in aluminium alloys is not yet fully understood, therefore the deeper analysis of their mechanical and electrical properties is important. These properties can be influenced by precipitate formation. Resistometry is a simple online method to monitor changes in the microstructure of a metallic alloy. In this work we focused on natural and artificial ageing of the Al-Cu system with samples containing 2 - 4 wt.% of Cu. Natural ageing depends on quenched in vacancies, so on the quenching conditions. Samples were homogenized at various temperatures and rapidly quenched to ambient temperature. Afterwards four point measurements were conducted during natural ageing. Due to formation of Guinier Preston zones, the resistivity first increases, then slowly decreases, allowing to monitor the unmixing for different temperatures and for different quenching conditions for samples with ternary trace alloying metals other than Cu. Also the sensitivity of the setup allowed to investigate the annihilation of vacancies quenched in from different high temperatures in pure Aluminium.

MM 57.3 Thu 12:15 C 230

Bicontinuous microstructure formation through partial melting — •Zhongyang Li[1], Lukas Lührs[1], and Jörg Weissmüller[1,2] — [1]Institute of Materials Physics and Technology, Hamburg University of Technology, Hamburg — [2]Institute of Materials Mechanics, Helmholtz-Zentrum Hereon, Geesthacht

A bicontinuous bulk metal composite is synthesized with partial melting in this study. A single phase CuIn alloy is heated into the solid-liquid phase coexistence region at 843*C and forms an interpenetrated solid phase and liquid phase automatically. The underlying formation mechanism of this special structure is closely related to the grain boundary wetting phenomenon at high temperature. The completely and incompletely wetted grain boundaries at partial melting temperature are responsible for the connectivity of the liquid phase and the solid phase respectively. The bicontinuous structure can be preserved by quenching. Both interpenetrated solid and liquid phase can be obtained with a relatively short duration of partial melting and remain bicontinuous when exposed to prolonged heating. This research found a novel and easy method of producing bicontinuous bulk metal composite, with potential applicability to a wide range of other alloy systems.

MM 57.4 Thu 12:30 C 230

Investigation of rapid solid-state phase transformations with temperature and concentration gradients — •Stephanie Lippmann — Friedrich-Schiller-Universität Jena

The mechanism of a phase transformation depends on composition, undercooling, diffusion kinetics and the nature of the interface. Using the example of the Cu-Zn bcc phase, the high competition between different transformation mechanisms during quenching is discussed in detail based on experimental observations with temperature and concentration gradients. The investigation of the various mechanisms requires a significant level of fine-tuning. Employing one- and multidimensional, multicomponent concentration gradients and pulse heating, the conditions for diffusion controlled mechanism under kinetic effects, coupled growth, massive transformation and martensitic transformation are analysed. For pulse heating, a new device was developed and built. The high-current-low-voltage-approach allows controlled heating of low-resistance samples and a simultaneous measurement and asignment of local T-t curves and microstructures.

MM 57.5 Thu 12:45 C 230

From orbital to paramagnetic pair breaking in layered superconductor 2H-NbS2 — Davide Pizzirani[1,2], Thom Ottenbros[1,2], Maró van Rijssel[1,2], Oleksandr Zheliuk[1,2], Yulia Kreminska[3], Jasper Linnartz[1,2], Malte Rösner[2], Nigel Hussey[1,2,4], Anne de Visser[5], Jianting Ye[3], Steffen Wiedmann[1,2], and •Maarten van Delft[1,2] — [1]High Field Magnet Laboratory (HFML-EMFL), Radboud University, Nijmegen, Netherlands — [2]Radboud University, Institute for Molecules and Materials, Nijmegen, Netherlands. — [3]Device Physics of Complex Materials, Zernike Institute for Advanced Materials, University of Groningen, Groningen, The Netherlands — [4]H.H. Wills Physics Laboratory, University of Bristol, Bristol, United Kingdom — [5]Van der Waals-Zeeman Institute, University of Amsterdam, Amsterdam, The Netherlands

The transition metal dichalcogenide superconductors 2H-NbSe2 and 2H-NbS2 are intensively studied on account of their unique electronic properties, such as Ising superconductivity found in monolayers, with upper critical fields beyond the Pauli limit. However, interest in these materials is not limited to monolayers. Even in bulk crystals, there exist reports of multiband superconductivity and exotic states. Up to now, magnetotransport studies of these states in 2H-NbS2 are limited. Here, we report a detailed high-field mapping of the phase diagram of 2H-NbS2 by means of magnetotransport and magnetostriction. We compare bulk 2H-NbS2 and a 6 nm thick flake and find an enhanced Maki parameter in the flake, but with a reduced critical field, signifying a change of the relevant pair breaking mechanism.