MM 48: Phase Transitions V

Time: Friday 10:15–11:15 Location: H 0107

MM 48.1 Fri 10:15 H 0107

Adiabatic calorimeter for the determination of thermophysical properties on a metrological basis — •Axel Pramann[1], Hans-Walter Krupke[1], Yosuke Moriya[1,2], Steffen Rudtsch[3], and Stefan Sarge[1] — [1]Physikalisch-Technische Bundesanstalt, Bundesallee 100, 38116 Braunschweig, Germany — [2]Inst. for Solid State Physics, Univ. of Tokyo, 5-1-5 Kashiwanoha, 227-8581 Japan — [3]Physikalisch-Technische Bundesanstalt, Abbestr. 2-12, 10587 Berlin, Germany

A prototype of a new adiabatic calorimeter in the operation range of 20°C up to 200°C was developed at PTB. The precursor of our calorimeter has been operated at the NBS developed by West and Ginnings [1]. The calorimeter is operated in a step-wise heating mode for the determination of the enthalpy of fusion $\Delta_{\mathrm{fus}}h$, the temperature of fusion and heat capacities of solids. First experiments on Gallium and Indium gave $\Delta_{\mathrm{fus}}h(\mathrm{Ga}) = 80.130 \pm 0.003$ J/g and $\Delta_{\mathrm{fus}}h(\mathrm{In}) = 28.658 \pm 0.003$ J/g. Our experiments confirm the results of Archer and Rudtsch [2, 3] - which can be considered as the currently most accurate reference values - within their given uncertainty. The technical and experimental details as well as the principle of the determination of $\Delta_{\mathrm{fus}}h$ are described on a metrological basis. A further application will be the cryoscopic purity determination of fixed-point materials in thermometry.

[1] E. D. West, D. C. Ginnings, J. Res. Nat. Bur. Stand. 60, 309 (1958).
[2] D. G. Archer, J. Chem. Eng. Data **47**, 304 (2002).
[3] D. G. Archer, S. Rudtsch, J. Chem. Eng. Data **48**, 1157 (2003).

MM 48.2 Fri 10:30 H 0107

Statische atomare Verschiebungen in Cu-reichem Cu-Mn — •Bernd Schönfeld[1], Gernot Kostorz[2], Lee Robertson[3] und Gene Ice[3] — [1]Departement Materialwissenschaft, ETH Zürich — [2]Departement Physik, ETH Zürich — [3]Oak Ridge National Laboratory, USA

Die diffuse Streuung einer einkristallinen Cu-17,2 at.% Mn Probe, die bei 483 K für zwei Wochen ausgelagert worden war, wurde mit Röntgenstrahlen der Energien 6526 eV, 8969 eV und 8909 eV untersucht. Durch die große Variation des Streukontrasts konnten die atomsortenspezifischen statischen Verschiebungen neben den Nahordnungskoeffizienten bestimmt werden. Die beiden eingesetzten Auswertetechniken, die 3λ-Methode und die Georgopoulos-Cohen-Methode, zeigten eine gute Uebereinstimmung in den resultierenden Fourierkoeffizienten. Verschiebungen zwischen nächsten Nachbarn sind dominant und mit 0,0038 nm zwischen Cu-Mn-Paaren am größten. Die Ergebnisse werden mit Resultaten anderer Autoren verglichen und diskutiert.

MM 48.3 Fri 10:45 H 0107

Real-time transmission electron microscopy of equilibrium order fluctuations in Cu_3Au — Xavier Sauvage[1], •Harald Reichert[1], Klaus Mecke[2], Sebastian Kapfer[2], Fritz Phillipp[1], and Helmut Dosch[1,3] — [1]Max-Planck-Institut für Metallforschung, Heisenbergstrasse 3, 70569 Stuttgart, Germany — [2]Universität Erlangen-Nürnberg, Staudtstrasse 7, D-91058 Erlangen, Germany — [3]Universität Stuttgart, Institut für Theoretische und Angewandte Physik, Pfaffenwaldring 57, D-70550 Stuttgart, Germany

Using fluctuation microscopy we have monitored local order parameter fluctuations in the binary alloy Cu_3Au in real time with atomic resolution. Close to the phase transformation from the disordered A1 phase to the ordered $L1_2$ structure we found well defined ordered domains with a size of approximately 2nm which are fluctuating on a time scale of 1 second. The morphology of the fluctuations (size and shape) was quantified by Minkowski functionals. The analysis of the Minkowski functionals shows, that although the phase transformation is of first order, the transformation appears to be continuous on a local scale.

MM 48.4 Fri 11:00 H 0107

The influence of elastic strain onto the early stage of decomposition in Cu1,7at.%Fe — •Thomas Rademacher, Talaat Al-Kassab, and Reiner Kirchheim — Institut für Materialphysik, Friedrich-Hund-Platz 1, 37077 Göttingen, Germany

Dilute supersaturated Cu Fe alloys have been previously intensely studied in the course of classical homogeneous phase separation neglecting the influence of the anisotropical character of elastic strain.

In a former study HEINRICH et al. (Mat. Sci. Eng. A353 (2003) 92-98) showed that early stages of decomposition at low temperatures of supersaturated Cu Co alloys is mainly controlled by such strain energy. It governs the cluster's size and morphology. It also promotes the formation of chains of precipitates in the elastic soft <100> directions of the Cu-matrix which is in agreement with calculations by MIYASAKI and YAMAUCHI/DE FONTAINE in framework of linear anisotropic elasticity theory. In the current study, these phenomena will be discussed for Cu1,7at%Fe after a heat treatment at 722 K for times ranging from 1,5 to 168 hours. Atom Probe Tomography (APT) was used for measurements as well as the newly developed computer assisted Field Ion Image Tomography (cFIIT) involving an improved reconstruction algorithm which will be presented in short.

Chain like formation of precipitates can be observed. Furthermore the precipitates' positions are systematically determined by computer algorithms and additionally analysed for their relative positions. A preferential alignment in <100> directions can be shown which implies a contribution of the elastic strain on the decomposition behaviour.