MM 3 Flüssige und amorphe Metalle II

Zeit: Freitag 11:30–12:30 Raum: TU H111

MM 3.1 Fr 11:30 TU H111

Untersuchung magnetischer und mikrostruktureller Eigenschaften der massiven glasbildenden Legierung $Nd_{60}Fe_{30}Al_{10}$ — •A. Bracchi[1], K. Samwer[2], T. Niermann[1], M. Seibt[1] und S. Schneider[1] — [1]IV. Physikalisches Institut, Universität Göttingen, 37077 Göttingen — [2]I. Physikalisches Institut, Universität Göttingen, 37077 Göttingen

Massive glasbildende $Nd_{60}Fe_{30}Al_{10}$ Proben, die mit einer Abkühlrate von 100 K/s aus der Schmelze hergestellt wurden, sind mit SQUID-Magnetometrie, Kleinwinkelneutronenstreuung (SANS) und hochenergetischer Röntgenbeugung charakterisiert worden. Die SQUID-Messungen im Temperaturbereich von 4.2 K bis 650 K zeigen zwei Übergänge, die auf zwei magnetische Phasen hinweisen. Die magnetischen Eigenschaften lassen sich in dem Temperaturbereich (50 K $<$ T $<$ 470 K), in dem nur eine ferromagnetische Phase vorliegt, mit dem „Domain-Wall-Pinning“ Modell deuten. Um die Mikrostruktur der Probe und die „Pinning“ Zentren zu charakterisieren, wurden SANS Messungen mit polarisierten und nicht polarisierten Neutronen durchgeführt. Aus diesen Messungen wurden strukturelle und magnetische charakteristische Längen ermittelt. Zur Deutung der magnetischen Eigenschaften und der Streuergebnisse wird ein paramagnetic core-ferromagnetic shell model für nanokristalline Ausscheidungen in einer ferromagnetischen amorphen Matrix vorgeschlagen.

Dieses Projekt wird von der DFG in Rahmen des SFB 602 gefördert.

MM 3.2 Fr 11:45 TU H111

Mechanical properties of slowly cooled Zr-based composites containing dendritic bcc phase precipitates — •Nicolle Radtke[1], Jürgen Eckert[1,2], Uta Kühn[1], and Ludwig Schultz[1] — [1]IFW Dresden, Institut für Metallische Werkstoffe, Postfach 270016, 01171 Dresden — [2]TU Darmstadt, Institut für Physikalische Metallkunde, Petersenstr. 23, 64287 Darmstadt

We report about the microstructure, thermal stability and the mechanical properties of slowly cooled Zr-Nb-Cu-Ni-Al alloys with ductile bcc phase precipitates embedded in a glassy or a nanocrystalline matrix. The samples were prepared in form of rods by injection casting into a copper mould. The phase formation and the microstructure of the composite material are investigated by X-ray diffraction, EDX-analysis, scanning and transmission electron microscopy. The thermal stability was examined by differential scanning calorimetry and the mechanical behaviour was investigated by compression tests under quasistatic loading at room temperature and at higher temperatures. The formation of bcc phase dendrites and a glassy or a nanocrystalline matrix is strongly governed by the alloy composition and the actual cooling rate during solidification. Besides, changes in composition and cooling rate lead to different volume fraction and size of the bcc phase precipitates and, hence, to different values of yield strength, elastic and plastic strain. The formation of a nanocrystalline matrix depends on the melting temperature of the alloy and, hence, the cooling rate. Surprisingly, these sample exhibits higher yield strength and plastic strain than the samples containing an amorphous matrix.

MM 3.3 Fr 12:00 TU H111

The temperature dependence of the deGennes narrowing in liquid Rubidium — •Franz Demmel[1] and Christoph Morkel[2] — [1]ILL, Grenoble — [2]TU München, München

Recent diffraction experiments on levitated undercooled liquid metals have been modelled with a contribution of icosahedral clusters in the melt. The temperature dependence of the density time correlation function at next neighbour distances should also be a sensitive parameter for detecting clusters and their possible melting. We performed coherent inelastic neutron scattering experiments on the alkali metal Rubidium around the structure factor maximum. Fifteen temperatures from the melting point up to two times the melting point have been measured. The experiment was performed at three axis spectrometers of the Forschungsreaktor München FRM and at the ILL, Grenoble. The line width shows a linear increase with temperature. But the peak values decrease in a nonlinear way and indicate a change in dynamics around 1.5*T_{melt}. One can speculate whether this decrease in amplitude above the macroscopic melting temperature is related to the melting of solid-like structures (clusters) in the liquid state.

MM 3.4 Fr 12:15 TU H111

Diffraction Studies On the Short-Range Order in Metallic Melts — •Dirk Holland-Moritz[1], Thomas Schenk[1], Oliver Heinen[1], Virginie Simonet[2], Robert Bellissent[3], and Dieter M. Herlach[1] — [1]DLR, Institut für Raumsimulation, D-51147 Köln — [2]Laboratoire Louis Néel, CNRS, BP166, F-38042 Grenoble Cedex 9 — [3]Centre d'Études Nucléaires de Grenoble, DRFMC/SPSMS/MDN, F-38054 Grenoble Cedex

Following the pioneering work of Frank, an icosahedral short-range order should be energetically favoured in undercooled metallic melts. This hypothesis was recently experimentally confirmed by neutron- and X-ray diffraction investigations on stable and undercooled liquids of the pure metals Ni, Co, Zr and Fe and of various alloys forming quasicrystals and polytetrahedral phases. In this work we present experiments on the short-range order of undercooled $Co_{75}Pd_{25}$ melts. These melts are of special interest because they show the onset of magnetic ordering if they are undercooled close to the magnetic Curie temperature. Moreover, investigations on the short-range order of stable and undercooled melts of Ti are presented. The liquids were containerlessly processed und undercooled by use of the electromagnetic levitation technique which was combined with the technique of energy dispersive diffraction of synchrotron radiation and elastic neutron scattering in order to determine the structure factors. For both sample materials, similar as for most other metallic melts, the measured structure factors are well described if an icosahedral short-range order is assumed to prevail in the melt. This work was supported by DFG under contract Nos. Ho1942/1, Ho1942/2 and Ho1942/4.