The unusual properties of the narrow-gap semiconductor FeSi continue to attract attention of many theoreticians and experimentalists due to its similarities with some rare-earth compounds known as Kondo insulators. We present a comprehensive ellipsometric study on $Fe_{1-x}Co_xSi$ single crystals (x=0-0.2) in the spectral range from 0.01 to 6.2 eV. Direct and indirect band gaps of 73 meV and 10 meV, respectively, are observed in FeSi at 7 K. Four infrared active modes are assigned at 206, 329, 352, and 458 cm^{-1} for FeSi. Two of them are asymmetric at low temperatures, reflecting the phonon-phonon and electron-phonon coupling in the system. As temperature increases, the indirect gap changes sign manifesting semiconductor to semimetal crossover. The corresponding spectral weight gain at low energies is recovered within an energy range of several eV. The present findings imply that the electron-phonon interaction and semimetallic character of FeSi play the dominant role in the broad-band spectral weight transfer and strongly support the model that $Fe_{1-x}Co_xSi$ can be well described in an itinerant picture taking into account self-energy corrections.

MM 35.7 Wed 16:30 P4

A theory for electrical resistivity for amorphous metals — •Golam Mohammed Bhuiyan[1], Md. Abdur Rashid[2], and A. Z. Ziauddin Ahmed[3] — [1]department of theoretical physics, university of dhaka, dhaka-1000, bangladesh — [2]department of physics, university of dhaka, dhaka-1000, bangladesh — [3]department of physics, university of dhaka, dhaka-1000, bangladesh

An attempt has been made to develop a theory for the electrical resistivity for amorphous metals beyond the Ziman's formalism. The starting point of the proposed theory is the Baym's general formula for electrical resistivity. The Baym's theory is then extended within the quasi-crystalline approximation to have two important terms describing the normal and Umklapp scattering. The present theory thus gives a better picture to understand basic scattering processes which are very much involved in the real electronic transport mechanism. The proposed theory will also give better insight to understand resistivity of disordered systems like liquid metals in particular in the supercooled state.

MM 35.8 Wed 16:30 P4

Primary Crystallisation in Al-rich Metallic Glasses at unusually low Temperatures — •Joachim Bokeloh[1], Nancy Boucharat[2], and Gerhard Wilde[1] — [1]Institut für Materialphysik, Westfälische Wilhelms-Universität Münster — [2]Institut für Nanotechnologie, Forschungszentrum Karlsruhe

The initial stage of the primary crystallisation reaction and the glass transition of the marginal metallic glass Al-Y-Fe has been investigated in conventional and modulated DSC, microcalorimetry, XRD and TEM.

A sharp onset of the primary crystallisation was found in microcalorimetry and XRD studies at temperatures 120 K below the primary crystallisation peak observed in conventional DSC.

A systematic MDSC study of annealed samples revealed a wide spectrum of glass transition onsets which show a strong dependence on the annealing temperature and duration. In addition, the glass transition onsets can be linked to the initial stage primary crystallisation.

The observed spectrum of glass transition onsets may be interpreted as experimental evidence for a phase separation that precedes the nucleation and growth of aluminium nanocrystals in the respective al-rich metallic glasses.

MM 35.9 Wed 16:30 P4

New detectors improve the performance of ASAXS beamline B1 at HASYLAB, DESY — •Ulla Vainio, Tom Schubert, Michael Lohmann, Stephan Botta, Thorsten Kracht, and Rainer Gehrke — HASYLAB at DESY, Notkestr. 85, D-22607 Hamburg, Germany

B1 at the DORIS synchrotron at DESY is one of the first anomalous small-angle x-ray scattering (ASAXS) beamlines. Several upgrades will make the beamline again competitive. During 2008 many improvements have been made to the beamline: A new, thicker Si (311) monochromator crystal is now used. A cooling system for the first monochromator crystal was designed and applied. Better alignment of the whole beamline was made, so a smaller beamstop for the primary beam can be used. Automated sample heating programs were implemented to the measurement program, allowing in situ measurements. A PILATUS 100k detector was tested at the beamline. It was shown that PILATUS has at 11 000 eV about ten times better efficiency and much better resolution than the old 2D gas detector. ASAXS measurements showed very good quality. In 2009 the PILATUS detector and a new system allowing for simultaneous SAXS and wide-angle x-ray scattering (WAXS) measurements will be available. A 1D MYTHEN detector can be used as a WAXS detector. All the improvements combined with new Matlab based data processing tools developed 2007 and 2008 allows for speedy and easy SAXS, WAXS and ASAXS measurements that can be analysed on site right after the measurement of the sample.

MM 35.10 Wed 16:30 P4

Preparation and characterisation of graphite particle reinforced $Zr_{48}Cu_{36}Ag_8Al_8$ BMG composites — •Enrico Mund[1], Jayamani Jayaraj[2], Annett Gebert[2], and Ludwig Schultz[1,2] — [1]TU Dresden, Helmholtzstr. 10, 01069 Dresden — [2]IFW , Helmholtzstr. 20, 01069 Dresden

Bulk metallic glasses exhibit good mechanical properties such as high strength and high hardness. The deformation and fracture properties of BMGs are controlled by the initiation and propagation of shear bands. In order to improve further the mechanical properties, manipulation of the shear band propagation is eminent. By creating ex-situ particle reinforced BMG composites the fracture strength and plasticity can be increased. The particles can act as crack-stopper for the shear bands and become barriers for the shear band propagation.
In this work we use graphite particles due to their easy availability and designated properties. A way to fabricate graphite particle reinforced BMG is demonstrated for a selected ZrCuAgAl alloy with a high glass forming ability. Samples are characterised by various analyses methods in comparison to the monolithic BMG. XRD, SEM and DSC examinations show the influence of the graphite particles to the phase evolution upon casting and the thermal alloy behaviour. Compression tests are carried out to clarify the effect of different graphite particle volume fractions on the mechanical properties. Furthermore the influence of different particle size distributions on the mechanical properties is examined. An optimal relation between particle size and volume fraction for a reinforced BMG with increased plasticity will be proposed.

MM 35.11 Wed 16:30 P4

Relaxation behavior and rheologie of amorphous solids in the cooperative shear zone-model — •Moritz Schwabe, Dennis Bedorf, and Konrad Samwer — I. Physikalisches Institut, Universität Göttingen, Friedrich-Hund-Platz 1, 37077 Göttingen, Germany

In the model of the potential energy landscape (PEL) from Stillinger and Weber, it is important to distinguish two different (beta and alpha) relaxations. In the PEL this is described in the change-over to a new local configuration (intrabasin hopping) or to a configuration with a convert potential energy (interbasing hopping). [1] To describe the response of the system in the cooperative shear zone - model to an external stress, a Frenkal-approach is chosen, which shows the decrease of the barrier height in the PEL. [2]

With this background we study the transition from the elastic to the anelastic response of a metallic glass (PdCuSi) via the change of the temperature and the force. To describe this transition from the linear to the nonlinear behavior we will present on the one hand stress-strain curves in the range from ambient temperature to above Tg and on the other hand creep tests with different forces and temperatures. We thank the SFB 602 and the GRK 782 for financial supporting.

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MM 35.12 Wed 16:30 P4

Study of local and global elastic properties by atomic force acoustic microscopy and ultrasonic spectroscopy of a metallic glass — •Hannes Wagner[1], Stefan Küchemann[1], Christian Vree[1], Walter Arnold[2], and Konrad Samwer[1] — [1]I.Physikalisches Institut, Universität Göttingen — [2]Permanent address: Department of Materials and Technology, Saarland University, Saarbrücken

We are looking for local variations of the indentation modulus of a metallic glass. To visualize this effect we use an atomic force acoustic microscope, where the cantilever of an atomic force microscope is excited by a transducer at ultrasonic frequencies while the sensor tip is contacting the sample surface. From various resonance frequencies of this contact we obtain information about the local stiffness. By using the mechanical model of a vibrating cantilever [1] we are able to derive the indentation modulus of the metallic glass.