MM 59: Complex Materials II

Time: Thursday 17:00–18:15 Location: H 1029

MM 59.1 Thu 17:00 H 1029

An atomic model for Metadislocation Motion: How do hundreds of Atoms move in a coordinated way? — •Marc Heggen and Michael Feuerbacher — Peter Grünberg Institut, Forschungszentrum Juelich GmbH, D-52425 Juelich

Metadislocations are highly complex defects which involve several hundreds of atoms in their core. We present a microstructural investigation on Metadislocations in the complex metallic alloy xi'-Al-Pd-Mn using aberration-corrected high-resolution scanning transmission electron microscopy. We show that the metadislocation core is highly ordered and based on atomic clusters. It possesses a multiscale structure with an inner core comprising the full strain of the metadislocation and an outer core which is not strained but has a modified cluster structure with respect to the bulk. A first atomic model for metadislocation motion is presented which involves the coordinated movement of hundreds of atoms along various directions.

MM 59.2 Thu 17:15 H 1029

Magnetic and transport studies on Ce(Pd1-xCux)3 alloys — •Mahboubeh Houshiar — Shahid Beheshti University, Tehran, Iran

The system of compounds Ce(Pd1-xCux)3 with (x = 0, 0.017, 0.033 and 0.133) crystallize in the cubic AuCu3 - type structure with copper entering the lattice in substitution for Pd. With increasing copper content they show temperature shifts in max resistivity and TEPmax, but for higher concentration the maximum disappears. The susceptibility shows a large reduction in the paramagnetic Curie temperature with increasing x which indicate rapid decrease of the Kondo temperature with increasing copper content.

MM 59.3 Thu 17:30 H 1029

Pinning of Domain Walls in Helical Magnets — •Bahman Roostaei and Thomas Nattermann — Institute for Theoretical Physics, University of Cologne, Cologne , Germany

Helical magnets are realized in frustrated antiferromagnets, e.g. in rare earth metals Er, Tb, Dy, and Ho or as well in alloys like Gd_xY_{1-x} and $CsCuCl_3$. In centro-symmetric crystals the helical order may be left or right handed. It was shown recently that helical magnets exhibit a new type of domain walls which includes vortex lines. We have developed a theory for these domain walls that can address their static and dynamic properties based on basic microscopic parameters of the system. In particular we have calculated the elastic constants of such vortex walls and tested our theory numerically. One of the most important questions about domain walls in helical magnets is their interaction with disorder present in the system. We have investigated the effect of disorder on the roughness of these walls. Normally, in the presence of disorder there is a finite threshold force density for depinning the wall. we have modeled the near-threshold dynamics of the vorex walls and estimated the threshold force based on vortex properties and other microscopic parameters of the system.

MM 59.4 Thu 17:45 H 1029

Thermal stability and soft magnetic properties of Co-Fe-Hf-B glassy alloy with wide supercooled liquid region — •Amir Hossein Taghvaei[1,2], Mihai Stoica[1], Uta Kühn[1], and Jürgen Eckert[1] — [1]IFW Dresden, Germany — [2]Shiraz University, Shiraz, Iran

A new glassy alloy with composition of Co40Fe22Hf6.5B31.5 was synthesized by melt spinning method. The thermal stability and crystallization process were investigated by differential scanning calorimetry (DSC) and X-Ray diffraction (XRD) in reflection mode using Co Kα radiation. The DSC profile of ribbons showed the glass transition at 903 K, followed by a supercooled liquid region of 62 K before crystallization. The glassy phase devitrified through a single sharp exothermic peak in to (Co, Fe)2B, (Co, Fe)3HfB2 and (Co, Fe)21Hf2B6 intermetallic compounds. The activation crystallization energy of 912 KJ/mole measured using the Kissinger approach, confirmed the very high thermal stability of this alloy. Magnetic measurements indicated that the as cast ribbon has the coercivity, magnetization and Curie temperature of 5 A/m, 47 Am2/kg and 431 K, respectively.The high thermal stability can be explained by the sluggish nucleation and slow growth of the complex (Co, Fe)3HfB2 and (Co, Fe)21Hf2B6 intermetallics.

MM 59.5 Thu 18:00 H 1029

Crowding phenomenon of scattered probe atoms in a Supercooled binary Lennard-Jones mixture — •Imad Ladadwa[1] and Andreas Heuer[2] — [1]FBSU, 15700 Tabuk, KSA — [2]Westfälische Wilhelms-Universität Münster, Institut für physikalische Chemie, Corrensstrasse 30, 48149 Münster, Germany

The crowding effect phenomena have been investigated by performing a molecular dynamics simulation on a three dimensional Lennard-Jones binary mixture. When coupling a small randomly chosen fraction of particles to an external field we observed that these particles tend to form strings. Their sizes strongly depend on the external driving force as well as on the simulation time. This behaviour reflects a crowding effect which resembles an induced effective attraction force acts on the probe atoms and drives them to create a string like structures. The formation of these strings as a collective cooperative motion leads to a significant modification of the non-linear behavior of the velocity-force relation.