MA 23: Magnetic Shape Memory Alloys I (jointly with MM)

Time: Tuesday 12:15–13:00 Location: HSZ 04

MA 23.1 Tue 12:15 HSZ 04

Relationship between orientation and strain of polycrystalline Ni50Mn29Ga21 samples — •Claudia Hürrich[1], Martin Pötschke[1], Stefan Roth[1], Bernd Rellinghaus[1], and Ludwig Schultz[2] — [1]IFW Dresden, Institute for Metallic Materials, P. O. Box 270116, 01069 Dresden, Germany — [2]Dresden University of Technology, Department of Mechanical Engineering, Institute for Materials Science, 01062 Dresden, Germany

The Ni-Mn-Ga magnetic shape memory alloy provokes plenty of interest for application because of the effect that twin variants reorient by the action of an external magnetic field. Most of the experiments were concentrated on single crystals. But, this effect can also be realised in polycrystals which can be prepared much more efficiently. Here, polycrystalline samples were prepared by directional solidification with a <100> fibre texture of the high temperature cubic phase parallel to the heat flow. A heat treatment was applied for chemical homogenisation and stress relaxation. Samples were heated up to the austenitic state and cooled down under load. The microstructure was analysed by EBSD before and after that treatment. Stress-strain curves were measured at room temperature and at 40°C. As a result of such treatment the twinning stress is reduced and the twinning strain is maximised. This work is supported by DFG within SPP 1239.

MA 23.2 Tue 12:30 HSZ 04

Microscopic origin of magnetic anisotropy in martensitic Ni_2MnGa — •Peter Klaer, Tobias Eichhorn, Gerhard Jakob, and Hans-Joachim Elmers — Institut für Physik, Johannes Gutenberg-Universität Mainz, D-55128 Mainz, Germany

From angle-dependent x-ray magnetic circular dichroism (XMCD) transmission measurements we have derived a simple model for the magnetic anisotropy of epitaxial $Ni_2MnGa(101)/MgO(001)$ magnetic shape memory films. The magnetic shape memory film reveals an anisotropy in the Ni dichroism intensity for magnetization parallel and perpendicular to the film plane. The integrated anisotropy is related to the anisotropy of the orbital magnetic moment in agreement with the observed out-of-plane magnetocrystalline anisotropy. The spectral variation of the x-ray absorption can be traced back to changes in the spin-projected density of states when the magnetization vector is rotated from the easy to the hard magnetic axis, thus revealing the spin-orbit coupling of specific Ni $3d$ states as the microscopic origin of the magnetic anisotropy.

MA 23.3 Tue 12:45 HSZ 04

Effect of temperature and compositional changes on the vibrational properties of Ni-Mn-Ga alloys — •Semih Ener[1], Jürgen Neuhaus[1,2], Richard Mole[2], Klaudia Hradil[2], and Winfried Petry[1,2] — [1]Technische Universität München, Physik Department E13, Garching, Germany — [2]Technische Universität München, Forschungsneutronenquelle Heniz Maier-Leibnitz (FRM II), Garching, Germany

In Ni-Mn-Ga ferromagnetic shape memory alloys (FSMAs) the instability of the lattice as observed in the phonon spectra causes the structural transition by changing the temperature or by applying magnetic field in a particular direction. In this work we investigate the vibrational properties of two different FMSAs, Ni_2MnGa and $Ni_{49}Mn_{32}Ga_{19}$. The full phonon dispersions of these materials are compared with theoretical first principle phonon calculations. The inelastic neutron scattering experiments performed at the Forschungsneutronenquelle Heniz Maier-Leibnitz (FRM II) in addition to calorimetric and magnetic measurements give a detailed insight in the anomalous behavior around the structural and magnetic transition temperatures. The vibrational properties of austenite-premartensite (3M) phase and austenite-martensite (5M) phase transitions were investigated in detail to understand the differences between these two transitions. The results show same overall behavior for different compositions but the relation between the magnetic ordering and the phonon remains an open question as their particular behavior appeared at different temperatures.