Abstract

„High-pressure studies on the magnetism in Eu(II)-Chalcogenides and metallic Fe-Systems by nuclear forward scattering of synchrotron radiation and Mössbauer spectroscopy“

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The magnetic properties of Eu(II)-Chalcogenides EuX (X = S, Se, Te) (i), of Laves-phases RFe_2 (R = Lu, Sc) (ii) and of the classical Invar System $Fe_{65}Ni_{35}$ (iii) are investigated as function of pressure and temperature. The employed methods are nuclear forward scattering (NFS) of synchrotron radiation (SR) and conventional Mössbauer spectroscopy (MS) using the Mössbauer resonances ^{151}Eu and ^{57}Fe.

(i) The investigations on Eu(II)-Chalcogenides with ^{151}Eu-NFS were carried out in the low pressure phases (NaCl structure) as well in the CsCl-type high pressure phases. The investigated pressure range extend up to 88 GPa for EuS. At the phase transition to the CsCl structure dramatical changes of the hyperfine parameters and magnetic ordering temperatures are observed. For EuS as example the Curie temperature increases from 16.6 K at ambient pressure up to 290 K at 88 GPa. This thesis presents for the first time the systematics of the magnetic and electronic properties of the EuX in their CsCl-type high-pressure phases.

(ii) The investigations on the magnetic Laves phases RFe_2 were focused on the determination of the Curie temperatures T_C. Therefor the ^{57}Fe-NFS method was applied simultaneously at high temperature *and* high-pressure. A new effective method to determine magnetic ordering temperatures was developed, based on characteristical attributes of the NFS spectra at the loss of magnetic order.

(iii) The classical Invar alloy $Fe_{65}Ni_{35}$ was investigated by conventional ^{57}Fe-MS and by ^{57}Fe-NFS in a wide temperature range and at pressures up to 15 GPa. A well-defined correlation between Invar behaviour and magnetism was found.