MA 26 Hauptvorträge Fauth / Acet

Zeit: Dienstag 14:00–15:00 Raum: TU H1028

Hauptvortrag

MA 26.1 Di 14:00 TU H1028

A spectroscopic look at small particle magnetism from the atom to nanoscale solids — •Kai Fauth — Physikalisches Institut der Univ. Würzburg, Am Hubland, 97074 Würzburg — Max-Planck-Institut für Metallforschung, Heisenbergstr. 3, 70569 Stuttgart

The investigaton of (sub-) nanoscale objects must take the interaction with their environment into consideration, since they have a high proportion of surface atoms. In order to understand the role of these interactions, in particular with respect to magnetic properties, interaction - free particles should be compared with the same particles in the presence of interactions. X-ray magnetic circular dichroism (XMCD) proves to be a highly versatile tool to tackle this question, since it combines several advantages such as element specificity, high sensitivity and the possibility to disentangle spin and orbital contributions to the magnetization.

The presentation will discuss realizations of the above scenario for both, atoms and small Co and Ni clusters deposited from a molecular beam and magnetic nanoparticles (Co, FePt) prepared by chemical means. In the case of small clusters the magnetic properties of matrix-isolated clusters in Argon films are compared to those which are observed when they are exposed to a markedly interacting substrate. For the case of magnetic nanoparticles it will be shown that using mild reactive plasma treatments, full control over the chemical state of the particle surface can be obtained while preserving the integrity of the layer structure. In this way, the role of stabilizing ligands as well as of surface oxide formation can be investigated.

Hauptvortrag

MA 26.2 Di 14:30 TU H1028

Magnetic instabilities in Fe_3C (cementite) particles observed with Fe K-edge x-ray circular dichroism under pressure — •Mehmet Acet — Fachbereich Physik, Universität Duisburg-Essen, 47048 Duisburg

The atomic volume is a prime parameter that characterizes electronic properties of solids. Around the equilibrium volume, the electronic structure of a solid can be stable in a relatively broad volume range (20-25 percent) or it can be unstable with respect to an energetically lower lying electronic state by a few meV, when the atomic volume is varied by 3-5 percent. In magnetic solids, the instability of an electronic structure can be detected by probing the magnetic moment while varying the atomic separation by applying hydrostatic pressure. Such instabilities can be found in some 3d-transition metals and alloys incorporating Fe, Mn, and Co as well as in some rare-earth intermetallic compounds. In this report, we present results showing that magnetovolume instabilities can also be present in interstitial solids, specifically in Fe_3C (cementite), for which a rapid change in the magnetic moment is found from about 1.8 μ_B to nearly vanishing values at pressures of about 8 GPa. We show that the Fe K-edge x-ray circular dichroism technique in conjunction with a diamond anvil cell is particularly useful for studying volume dependent magnetic instabilities in Fe alloys and compounds. We examine additionally the equation of state of Fe_3C to show that the rapid change in the magnetic moment is not associated with a structural transformation.