Stuttgarter Physikalisches Kolloquium

Max-Planck-Institut für Intelligente Systeme
Max-Planck-Institut für Festkörperforschung
Fachbereich Physik, Universität Stuttgart

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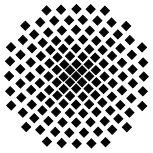

Dienstag, 16. April 2013 | **17.15 Uhr** | **Hörsaal 2 D5**

Stuttgarter Max-Planck-Institute, Heisenbergstraße 1, 70569 Stuttgart-Büsnau

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Dilute Ferromagnetic Oxides and d^0 ferromagnets – Fact or Fantasy?

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Abstract

There are many reports in the literature of ferromagnetism in thin films and nanoparticles of nonmagnetic oxides doped with a few percent of transition metal cations. In some cases, the d^0 materials, samples are ferromagnetic even when undoped. The reports are controversial, not least because they contradict received wisdom regarding the magnetism of oxides. Based on consideration of superexchange, these materials should be paramagnetic when doped below the percolation threshold. Their unusual ferromagnetism is a high-temperature phenomenon, which is largely anhysteretic. The magnetization process is controlled by dipolar interactions, and only a tiny fraction of the volume of the films or nanoparticles is actually magnetic.

Based on this experimental analysis, two quite different models are proposed. One is a Stoner model of wandering axis ferromagnetism, where the magnetism resides in an impurity band associated with defects such as grain boundaries, and the associated density of states is populated by charge transfer from a proximate charge reservoir. The other is quite different; it depends on giant orbital moments associated with pseudospin excitations in a graphene-like lattice with topological defects.