

# SFB 608

## Einladung zum Kolloquium

- Ort:** Universität zu Köln  
II. Physikalisches Institut, Seminarraum 201
- Zeit:** 14.03.2007 14:30 Uhr
- Sprecher:** Dr. Joachim Deisenhofer  
Geneva
- Thema:** Optical properties of the 1D antiferromagnet  $\text{KCuF}_3$

The perovskite  $\text{KCuF}_3$  is presumably one of the best realizations of an ideal 1D antiferromagnetic Heisenberg chain. This effective magnetic dimensionality is a direct consequence of the orbital ordering in this compound and ever since  $\text{KCuF}_3$  has been considered to be an archetype of an orbitally ordered system.

Recent results of resonant x-ray scattering studies had shown a considerable change in the orbital ordering parameter at a temperature of 43 K, close to but well distinguishable from the antiferromagnetic ordering at the Néel temperature  $T_N=39$  K.

Using optical spectroscopy we could identify the crystal field excitations which become observable due to their coupling to lattice vibrations, thus forming a vibronic state that allows for the appearance of electric dipole transitions. These local  $d-d$  transitions represent a sensitive means to probe change in the local symmetry and, hence, should reflect the reported changes in orbital ordering. Upon cooling below 43 K it was possible to observe the emergence of very sharp optical absorption features related to these local orbital excitations. The appearance of these transitions evidences a symmetry breaking at  $T = 43$  K which makes these excitations optically allowed. This structural change can be seen as a precursor for the antiferromagnetic ordering that locks in at 39 K and might be a generic feature of orbitally ordered antiferromagnets.

Gez. Prof. M. Grüninger