Bayerische Akademie der Wissenschaften

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Master Thesis

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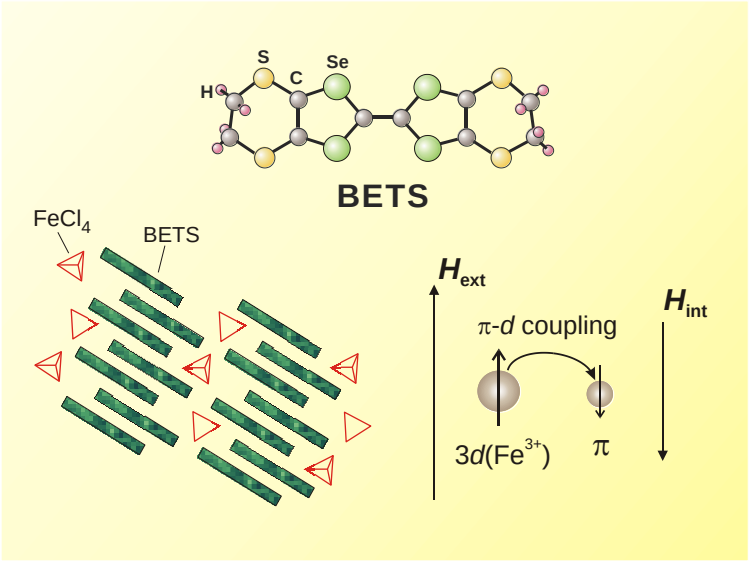
One of the challenging goals in modern materials science is the rational design of multifunctional molecular compounds that combine technologically useful features such as electrical conductivity and magnetism. A very promising strategy is to create hybrid organic/inorganic crystals comprising two functional sublattices exhibiting distinct properties.

Recently, several layered compounds have been synthesized in which ferro- or antiferromagnetic ordering is caused by the *d*-electron spins of magnetic ions incorporated into the inorganic layer whilst the organic layers are responsible for the metallic conductivity via overlapping unsaturated molecular π-orbitals.



The coexistence and interaction between two different systems may lead to new fascinating physical phenomena. For example, the interaction between magnetic *d*-electrons and conducting π-electrons in the organic conductor λ-$(BETS)_2FeCl_4$ gives rise to a very unusual superconducting state which only exists in strong magnetic fields, above 10-20 T. The present topic for Diploma work:

Interplay between (super)conducting and magnetic properties in organic conductors

implies comprehensive studies of the influence of magnetic fields and pressure on the electronic state of this and similar materials by magnetotransport and magnetization experiments.

The laboratory is fully equipped with the up-to-date technique required for the experiments: 15-17 T superconducting magnet, ^{3}He- and ^{4}He-cryostats for working at temperatures between 300 and 0.4 K, setup for applying highly hydrostatic pressure in the range of 0 to 15 kbar, precise technique for measuring resistive and magnetic properties of sub-milligram single crystals of organic conductors. A part of the experiments, at fields up to 35 T, will be performed at the High Magnetic Field Laboratory in Grenoble, France.

If you are interested in the topic, you are welcome to contact Michael Kunz (WMI, room 133, tel. 089/289-14221) or Dr. Mark Kartsovnik (WMI, room 132, tel. 089/289-14223) or Prof. Dr. Rudolf Gross (WMI, room 101, tel. 089/289-14201);
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