

Synthesis, theoretical examination and experimental investigation of emergent iron-based superconductors

Initiative: Trilaterale Partnerschaften – Kooperationsvorhaben zwischen Wissenschaftler(inne)n aus der Ukraine, Russland und Deutschland

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The project will address the most emergent topics of iron pnictides and chalcogenides (FeSCs). It is planned to synthesize new crystals not studied so far and to study their unique physical properties. In particular, it is intended to continue the search for novel for metals charge collective excitations (indirect excitons) in related sister systems of KFe_2As_2 , to investigate the superconducting order parameter and magnetism in these systems. The phase diagrams of $\text{Ba}_{1-x}\text{A}_x\text{Fe}_2\text{As}_2$ ($\text{A}=\text{K}, \text{Cs}, \text{Rb}$), KFe_2As_2 - CsFe_2As_2 , NaFe_2As_2 - RbFe_2As_2 , KFe_2As_2 - KFe_2P_2 and $\text{RbxFe}_{2-y}\text{Se}_{2-z}\text{Sz}$ substitution series will be investigated. By means of point contact spectroscopy in the normal state the compounds AFe_2As_2 with small Ba doping will be studied to identify the charge collective excitations which were discovered in KFe_2As_2 . Using point contact Andreev reflections spectroscopy and the analog of the non-stationary Josephson Effect for point contacts (Shapiro steps), the change of the superconducting order parameter from s- to d- wave symmetries and the predicted intermediate s+id superconducting phase with time reversal broken symmetry will be searched for. In addition, the recently discovered C4- phase in alkali-doped BaFe_2As_2 will be investigated by means of Mössbauer and point contact spectroscopies. The expected experimental data will be analyzed within different theoretical model and approaches. This study will allow to make a significant step in understanding the triggering of the mechanism of superconductivity in unconventional Fe-SC.

Projektbeteiligte

Dr. Dmitri Efremov

Leibniz-Institut für Festkörper- und
Werkstoffforschung Dresden IFW
Institut für Festkörperphysik
Dresden

Prof. Dr. Yurii Naidyuk

National Academy of Sciences of Ukraine
B. Verkin Institute for Low Temperature
Physics and Engineering
Kharkiv
Ukraine

Dr. Igor Morozov

Lomonosov Moscow State University
Chemistry Department
Inorganic Chemistry Division
Moscow
Russland

Dr. Stefan-Ludwig Drechsler

Leibniz-Institut für Festkörper- und
Werkstoffforschung Dresden IFW
Institut fuer Theoretische Festkoerperphysik (ITF)
Dresden

Dr. Sabine Wurmehl

Leibniz-Institut für Festkörper- und
Werkstoffforschung Dresden IFW
Institut für Festkörperforschung
Dresden

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