MM 33: Transport II - charge transport

Time: Tuesday 12:00–13:00 Location: IFW D

MM 33.1 Tue 12:00 IFW D

Combined resistivity and Hall effect study on Na(Fe,Rh)As single crystals — Frank Steckel[1], •Federico Caglieris[1], Robert Beck[1], Maria Roslova[2], Dirk Bombor[1], Igor Morozov[1,3], Sabine Wurmehl[1,4], Bernd Büchner[1,4,5], and Christian Hess[1,5] — [1]Leibniz-Institute for Solid State and Materials Research, IFW-Dresden, 01069 Dresden, Germany — [2]Department of Chemistry and Food Chemistry, TU Dresden, 01062 Dresden, Germany — [3]Department of Chemistry, Lomonosov Moscow State University, 119991 Moscow, Russia — [4]Institut für Festkörperphysik, TU Dresden, 01069 Dresden, Germany — [5]Center for Transport and Devices, Technische Universität Dresden, 01069 Dresden, Germany

Electrical transport measurements are used to study the Rh-doped NaFeAs superconductor series with a focus on the tetragonal phase. The resistivity curvature has an anomalous temperature dependence evidencing in the phase diagram two crossover regions of changes in the scattering rate, the effective mass as well as of the charge carrier density. The first crossover region is directly connected to the structural transition and resembles the onset of resistivity anisotropy. The second crossover region can as well be deduced from the temperature dependent Hall coeffcient. A comparison to literature NMR data suggests this region to be connected with nematic fluctuations far above the tetragonal to orthorhombic phase transition.

MM 33.2 Tue 12:15 IFW D

Temperature dependence and lateral distribution of bias voltage driven charge transport through thin tantalum oxide films — •Jan Philipp Meyburg[1], Detlef Diesing[1], and Achim Walter Hassel[2] — [1]Institut für Physikalische Chemie, Universität Duisburg-Essen — [2]Johannes Kepler Universität Linz, 4040 Linz, Austria

The temperature dependence and the lateral distribution of currents in tantalum oxide (3–4 nm) based metal–insulator–metal devices induced by an applied voltage bias is studied from 80 K to 500 K. The sensitivity of the devices to a temperature change strongly depends on the polarity of the applied bias voltage. When the bias voltage weakens the internal field, the current increases by 4 orders of magnitude (Temperature increased from 400 K to 500 K). With bias voltages strengthening the internal field the current increases only by several 10 %. This asymmetry of the temperature dependence is strongly correlated with the asymmetry of the tunnel barrier and cannot be understood within the established Poole–Frenkel conduction or Schottky emission models. A new model presented here which fully includes the carrier transmission through a tilted barrier shows that tunnel emission explains the temperature dependences at different bias voltages.

MM 33.3 Tue 12:30 IFW D

Investigation of the conductivity-(micro-)structure correlation in Rectorite — •Wolfram Münchgesang[1], Anastasia Vyalikh[1], Juliane Weise[1], Maria T. Atanasova[2,3], Walter W. Focke[3], Gregor Mali[4], and Dirk C. Meyer[1] — [1]Technische Universität Bergakademie Freiberg, Institut für Experimentelle Physik, Freiberg, Germany — [2]Council for Geoscience, Pretoria, South Africa — [3]Institute of Applied Materials, Department of Chemical Engineering, University of Pretoria, Hatfield, South Africa — [4]National Institute of Chemistry, Ljubljana, Slovenia

The mixed-layer structure of Rectorite (Rt), made up of alternating nonexpandable (mica) and expandable (smectite) layers in a 1:1 ratio, can be used to transport and intercalate mobile ions like Na^+, Li^+, Sr^{2+} and Mg^+. Therefore Rt is in principle suitable as solid electrolyte and electrode in batteries. Starting from a crystallographic point of view, the changes of the temperature-depending complex conductivity of Rt with different by hydration replaced mobile species are discussed and correlated to structural and chemical data from solid-state nuclear magnetic resonance (NMR), powder diffractometry (PXRD) and X-ray photoelectron spectroscopy (XPS) measurements.
This work is financed by the Federal Ministry of Education and Research (BMBF) within the project SyNeSteSia (grant no 05K2014).

MM 33.4 Tue 12:45 IFW D

Platinum atomic contacts: from tunneling to contact — •Linda Angela Zotti and Ruben Perez — Departamento de Física Teórica de la Materia Condensada, Universidad Autónoma de Madrid, Madrid, Spain

We present a theoretical study of the electronic transport through Pt nanocontacts. We show that the analysis of the tunnelling regime requires a very careful treatment of the technical details. For instance, an insufficient size of the system can cause unphysical charge oscillations to arise along the transport direction; moreover, the use of an inappropriate basis set can deviate the distance dependence of the conductance from the expected exponential trend. While the conductance decay can be either corrected by employing ghost atoms or a large-cuto-radius basis set, the same does not apply to the corrugation, for which only the second option is recommended. Interestingly, these details were not found to have a remarkable impact in the contact regime. These findings are important for theoretical studies of distance-dependent phenomena in scanning-probe and breakjunction experiments.