DS 14: Transport Properties

Time: Thursday 9:30–10:15 Location: A 060

DS 14.1 Thu 9:30 A 060

Influence of the microstructure on the impedance of microstructured ceria thin films — •Jan L. Dornseifer[1,2], Janis K. Eckhardt[2,3], Mattias T. Elm[1,2,3], and Peter J. Klar[1,2] — [1]Institute of Experimental Physics I, Justus-Liebig-University, Giessen, Germany — [2]Center for Materials Research (ZfM), Justus-Liebig-University, Giessen, Germany — [3]Institute of Physical Chemistry, Justus-Liebig-University, Giessen, Germany

Polycrystalline thin films with mixed electronic and ionic conductive properties are essential for many energy devices. Their charge transport properties are often characterized by impedance spectroscopy (IS). The IS data is usually evaluated by using simple circuit models to correlate macroscopic properties with microscopic transport processes. Here, we show that the microstructure in polycrystalline ceria thin films has a significant impact on the impedance. An experimental approach has been developed to prepare ceria microstructures on sapphire substrates. Utilizing a lithographic process, single ceria microstructures were electrically contacted and investigated by IS. Novel computer-aided simulations based on an impedance network model are used to analyze the experimental IS data. In these simulations, the real ceria microstructure is accurately mapped and implemented. The results show that the influence of the microstructure on the impedance is stronger than previously thought. Further investigations are promising for establishing a new correlation model.

DS 14.2 Thu 9:45 A 060

Magneto-transport characterization of ultra-thin corrugated Cr2O3/Co/Pt layers — •Shahrukh Shakeel, Oleksandr Pylypovskyi, Pavlo Makushko, Denise Erb, Shengqiang Zhou, René Hübner, Jose Angel Fernandez Roldan, Olha Bezsmertna, Jürgen Fassbender, Oleksii Volkov, and Denys Makarov — Helmholtz-Zentrum Dresden-Rossendorf e. V., Dresden, Germany

Chiral magnetic textures are formed in low-dimensional ultra-thin magnetic systems due to the presence of intrinsic Dzyaloshinskii-Moriya interaction (iDMI), appearing due to the breaking or lack of inversion symmetry at the film interfaces [1]. Alternatively, in curvilinear magnetic systems, exchange-induced or extrinsic DMI (eDMI) emerges due to the geometrical breaking of local inversion symmetry [1]. The synergy between iDMI and eDMI, resulting into a mesoscale value of DMI (mDMI), enables the tunability of magnetochirality by selecting application specific material and geometry [1]. We studied this interplay by magneto-transport measurements of ultra-thin corrugated Cr2O3/Co/Pt layers with perpendicular magnetic anisotropy to calculate the effective spin-orbit torque (SOT) fields [4] and subsequently the mDMI strength for flat (reference) and corrugated samples. Whereby, a change in mDMI strength is observed due to the corrugations. Furthermore, the angular dependence of mDMI with respect to the angle between the crosses and corrugations was explored. References [1] O. Volkov et al., Sci. Rep. 8, 866 (2018). [2] J. Kim et al., Nat. Mat. 12, 240-5 (2012).

DS 14.3 Thu 10:00 A 060

Magneto transport in bilayer graphene cavities — •Florian Schöppl, Michael Barth, Klaus Richter, and Angelika Knothe — Institut für Theoretische Physik, 93053 Regensburg, Germany

The remarkable sample quality of bilayer graphene in combination with the unprecedented electronic control of the band-structure makes bilayer graphene an excellent platform for electron optics. While the purity of the system allows for ballistic transport on the micrometer scales [1,2], the trigonal warping of the band structure close to each K points induces a valley dependent selection of momenta leading to unique transport and scattering properties [3,4]. Interested in the interplay of symmetry breaking induced by a variety of all-electronic gate confinements and the trigonal warping, we implement various quantum mechanical tight binding models and deploy them to investigate magneto transport through bilayer graphene cavities.

[1]L. Seemann A. Knothe M. Hentschel, Gate-tunable regular and chaotic electron dynamics in ballistic bilayer graphene cavities, Phys. Rev. B (2023) [2]L. Banszerus M. Schmitz S. Engels M.Goldsche K. Watanabe T. Taniguchi B. Beschoten Ch. Stampfer, Ballistic Transport Exceeding 28μm in CVD Grown Graphene, Nano Lett. 2016 [3]C. Gold A. Knothe A. Kurzmann A. Garcia-Ruiz K. Watanabe T. Taniguchi V. Fal*ko K. Ensslin T. Ihn, Coherent Jetting behind a gate-defined channel in bilayer graphene, Phys.Rev. Lett. (2021) [4]J.K. Schrepfer S.C. Chen M.H. Liu K. Richter M. Hentschel, Dirac fermion optics and directed emession from single- and bilayer graphene cavities, Phys. Rev. B (2021)