

Investigation of the domain wall conductivity in uniaxial ferroelectrics

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

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The recently discovered ability to purposely write and erase nanoscopic conductive channels, the so-called charged domain walls (CDWs), across wide-bandgap and uniaxial ferroelectric LiNbO₃ (LNO) single crystals, forms an emergent feature for novel nanoelectronic applications and devices. Such CDWs are exactly in the focus of the current project. The goal is to establish an in-depth understanding of those physicochemical parameters that allow increasing and tuning this conductivity along CDWs. Optimizing the charge transport thus needs a twofold approach, with (a) improving the electron-hopping rate along charged domain walls for instance by doping domain walls within these single crystals, as well as (b) lowering the injection barrier at the interface between DWs and surface electrodes. Both aspects will be investigated under systematic variation of defect and doping concentration. Furthermore, the impact of the applied poling method on the form and electronic transport properties of CDWs in LNO will be investigated. Lastly, the concept of creating time-stable CDWs will be extended also to other uniaxial ferroelectrics, such as LiTaO₃ (LTO) and Sr_xBa_{1-x}Nb₂O₆ (SBN).

Projektbeteiligte

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Designing a Robust Kelvin Probe Setup Optimized Optimized for Long-Term Surface Photovoltage Acquisition

Electron-Beam Domain Patterning in Sr_{0.61}Ba_{0.39}Nb₂O₆ Crystals