Poster Presentation

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Functionality from real-structure: the oxygen vacancy in strontium titanate

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According to Bhalla et al. the ABX3 perovskite system is the single most versatile structure family regarding material properties. The wide range of functionalities is realised through manifold combinations of constituents for the A- and B-site in the structure. In confirmation and extension of this abundance of properties also the real structure has a profound influence on the properties of the material.
Here, we discuss the oxygen vacancy VO as the dominating point defect in the aristotype perovskite strontium titanate SrTiO3 and demonstrate how functionality can be realised by reversible redistribution processes within an external electric field.
Specifically, the anisotropic migration behaviour of oxygen vacancies [1] along the different orientations of the crystal and how their redistribution results in a polar modification of the surface region of strontium titanate migration-induced field-stabilised polar phase or MFP phase [2] will be treated. The MFP phase is created by the application of a static electric field of approximately 1MV/m, in which charged defects like oxygen vacancies redistribute. In the migration process cubic unit cells are distorted into tetragonal ones and stabilised by the field.
The polar structure of the modified perovskite entails new properties like pyro- and piezoelectricity [3,4]. Furthermore, the process of creating the MFP phase in strontium titanate reversibly deposits energy in the crystal, thus making it a complete solid state battery.
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