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Strain Induced Ferroelectricity in Orthorhombic REFeO3 Thin Films

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The search for materials being simultaneously ferroelectric and magnetic, ideally at room temperature, gained interest about a decade ago for its potential applications in energy efficient electronic devices [1]. Materials in which magnetic order induces ferroelectric order, also called multiferroics, are of interest because of their typically strong magnetoelectric coupling [2], such as orthorhombic REMnO3. Orthorhombic bulk REFeO3 has a similar crystal structure like REMnO3 and is expected to show similar physical properties. Theoretical calculations for bulk REFeO3 have shown that this class of materials can gain a large electrical polarization of up to 90 μC/cm2 at RT under large lattice misfit strain [3]. To verify the theoretical predictions, we are growing orthorhombic REFeO3 thin films on different single crystalline substrates using pulse laser deposition. We are using X-ray diffraction (XRD) for crystal structure analysis, for magnetic measurements a superconducting quantum interface device (SQUID), and to measure the electrical polarization a have a home-build Tower-Sawyer set-up. The films we have investigated so far are epitaxially grown (010) oriented DyFeO3 on (010) YAlO3 substrates. All films show ferromagnetic and antiferromagnetic properties and in some films we have been able to induce ferroelectricity at low temperatures.

Position

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