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Crystal symmetry and properties of low dimensional epitaxial oxides

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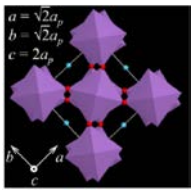

In complex oxide materials the occurrence of ferroelectric, ferromagnetic or other properties are for the most part determined by the detailed oxygen coordination of metal cations. More specifically, in the case of perovskite-type materials ABO_3, where A and B are metal cations, by the BO_6 octahedral orientations and rotations. At interfaces in epitaxial oxide hetero structures, for example magnetic junctions or capacitive structures, this oxygen sub-lattice is found to be different from its bulk counterpart.

I will discuss examples of oxygen sub-lattice engineering achieved by controlled thin film parameters such as digital thickness variation, polar discontinuous interfaces or the insertion of oxide buffer layers that influence the perovskite-type BO_6 sub-lattice. The effects of such thin film parameters on the structure and properties of various model systems are subsequently studied by *in situ* characterization techniques and high resolution scanning transmission electron microscopy. Often-encountered problems due to dead-layer effects, which normally hamper many ferromagnetic or ferroelectric functional devices, could be tackled this way. More importantly, besides improving the functionality of heterostructure devices one might expect to find surprising properties not found in the bulk, for example a new ferromagnetic insulating state, which has potential applications in spintronics.

Keywords: thin films, perovskites, transition metal oxides, crystal symmetry