Structure and properties of low dimensional epitaxial oxides; interfaces and superlattices

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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 ABO3, where A and B are metal cations, by the BO6 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 briefly introduce the status of the often-used technique to fabricate epitaxial layers, 'atomically controlled PLD', as well as give a few examples of oxygen sub-lattice and interface engineering achieved by controlled thin film parameters such as, composition, digital thickness variation, polar discontinuous interfaces or the insertion of oxide buffer layers that influence the perovskite-type BO6 sub-lattice or related structures. I will further elaborate on the effects of such thin film parameters on the structure and properties of various model systems that have been subsequently studied by in situ characterization techniques and high resolution scanning transmission electron microscopy. More practically, often-encountered problems due to dead-layer effects and interfacial issues when integrating oxides with technical platforms such as Si or GaN, will be discussed.