Exploring distorted phases in vanadate perovskites

Hugo Meley, Joeri de Bruijckere, Stefano Gariglio and Jean-Marc Triscone

DQMP, University of Geneva, 24 Quai E.-Ansermet 1211 Geneva 4 Switzerland

Since antiferrodistortive motions in perovskites can couple both to polarization and magnetic orders, strong distorted tilt systems are a natural case study to design multifunctional materials.
Here, vanadium perovskites have been chosen for their distorted phases, already present at room temperature. In multilayer structures, we expect these materials to exhibit a coupling between magnetic and polar orders.

In bulk, the octahedron rotation drives an improper antipolar mode that itself favors Jahn Teller distortions of the octahedron. These structural distortions determine also an orbital ordering, that is linked to an anti-ferromagnetic state of the system.

Ab-initio calculations [1] show that, in multilayer heterostructures made of different rare earth cations, the amplitude of the octahedron rotations vary from layer to layer and hence a ferroelectric state can be expected. To test this exciting prediction, we are growing vanadium oxide superlattices $AVO_3/A'VO_3$ in which the alternation of different rare earth radii breaks the symmetry of the bulk phase.

[1]$ J. Varignon *et al.*, ArXiv:1409.8422v1