MS20-03 | Characterization of Aperiodic Bi-based Layered Oxides Thin Films by TEM Multiscale Approaches

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Using strain engineering, metastable phases can be stabilized in the form of thin films. Besides their intrinsically small diffracting volume, these films are clamped onto a thick crystalline substrate that significantly complicate their analysis by X-ray diffraction methods and usually prevents any structure determination of unknown complex phases stabilized in the form of thin films. In this contribution we will show that the combination of multiscale approaches in a transmission electron microscope is a powerful tool to provide structural information using imaging, spectroscopy and 3D electron diffraction methods even for artificially grown layered composite structures (LCS).

We present here two novel Bi-based LCS prepared by pulsed lased deposition from Bi_2AlMnO_6 (BAMO) [1] and Bi_2NiMnO_6 (BNMO) [2] targets. Both LCS are composed of alternative layer stacking of two sub-lattices along the film growth direction where the sub-lattice 1 consists of a $(A/Mn)O_6$ octahedral slab with A= Al or Ni and the sub-lattice 2 consists of a Bi3O3 slab (Fig. 1). The sub-lattice 2 presents a stacking disorder whose origin can be understood based on a local structure inspection by STEM-HAADF imaging. In terms of properties, these new materials possess tunable physical properties including robust room-temperature ferromagnetism and unique optical properties [1,2].

[1] L. Li, P. Boullay et al., Nano Lett. 17 (2017) 6575-6582.
[2] L. Li, P. Boullay et al., Materials Today Nano (2019) accepted.