Oxide Interface Physics: a new group at UZH

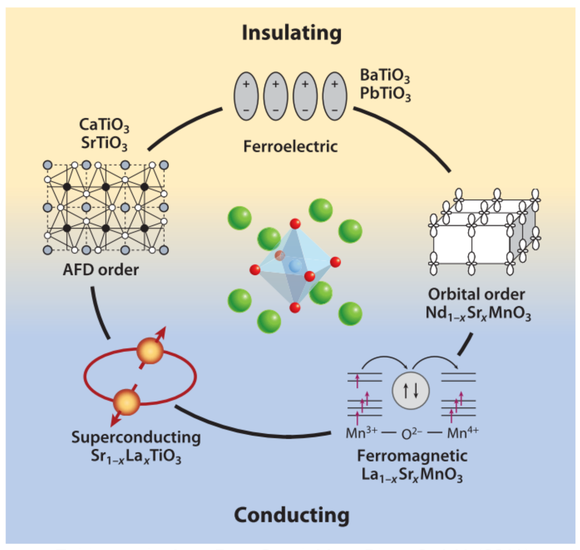
Gabriele De Luca

Jonathan Spring

Marta Gibert

Why oxide thin films and interfaces?

Electronic correlations in **transition metal oxides** result in fascinating properties that are absent in semiconductors:

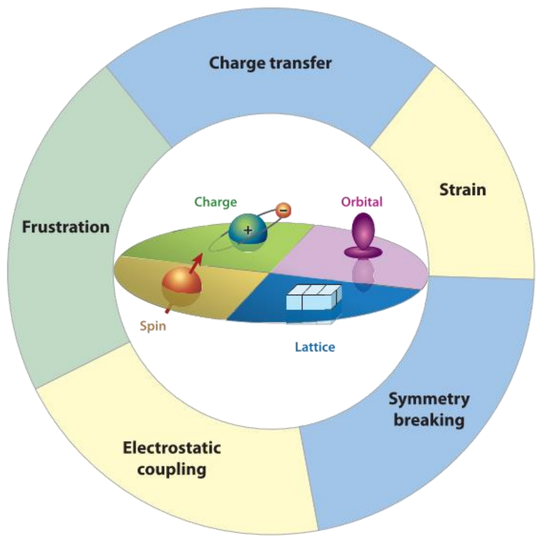


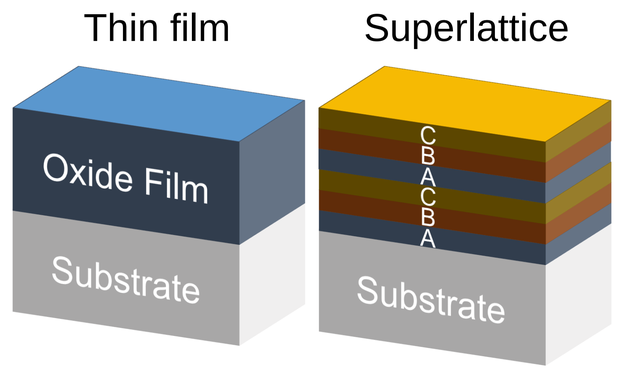
Zubko et al., *Ann. Rev. Cond. Matt. Phys.* **2**, 141 (2011)

- ❑ Ferromagnetism
- ❑ High-T_C superconductivity
- ❑ Metal-to-insulator transitions
- ❑ Multiferroicity
- ❑ Charge transfer
- ❑ Orbital ordering
- ❑ Colossal magnetoresistance
- ❑ Jahn-Teller distortions

…and many more

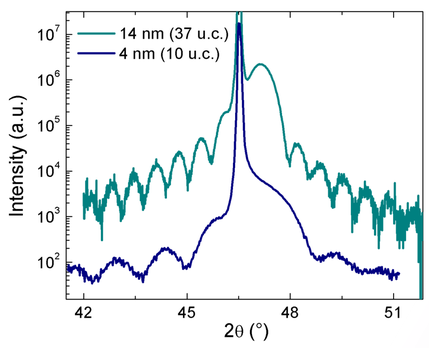
Merging oxides in different heterostructures allows to tune their functionalities and to find **novel material properties**

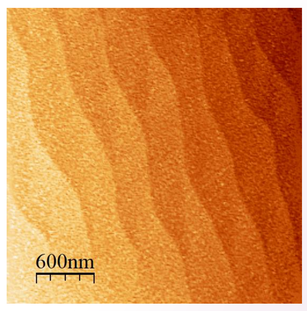




There are different ways of combining oxides together!

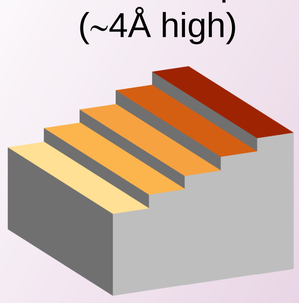
High resolution X-ray Diffraction (XRD)



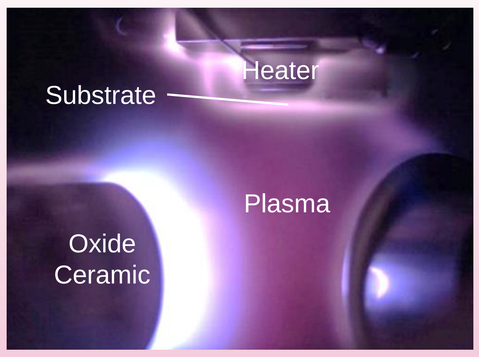


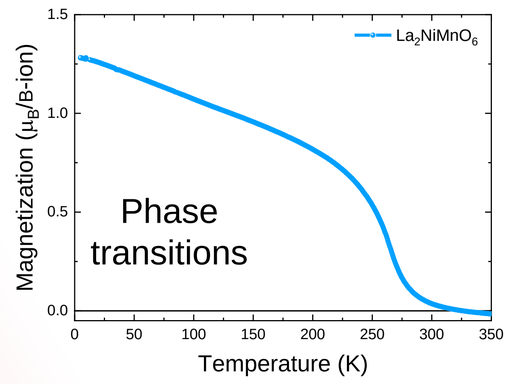
Atomic Force Microscopy (AFM)

Atomic steps (~4Å high)

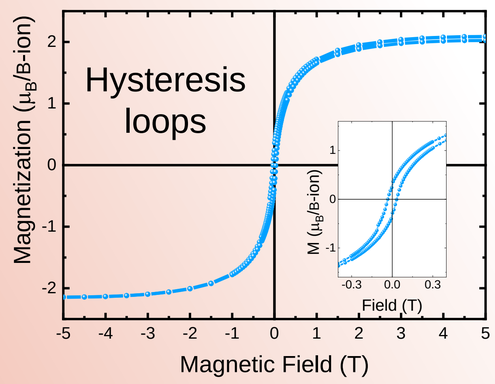


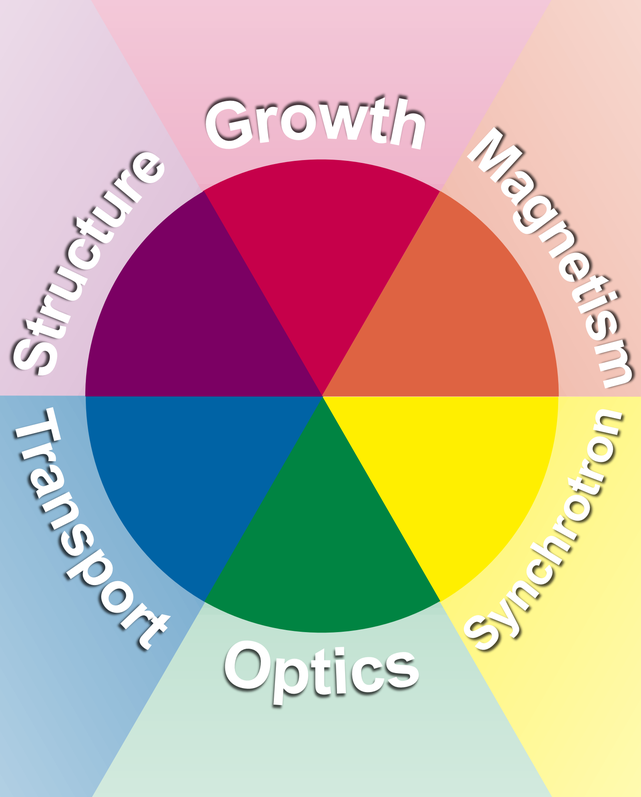
Radio Frequency (RF) off-axis magnetron sputtering

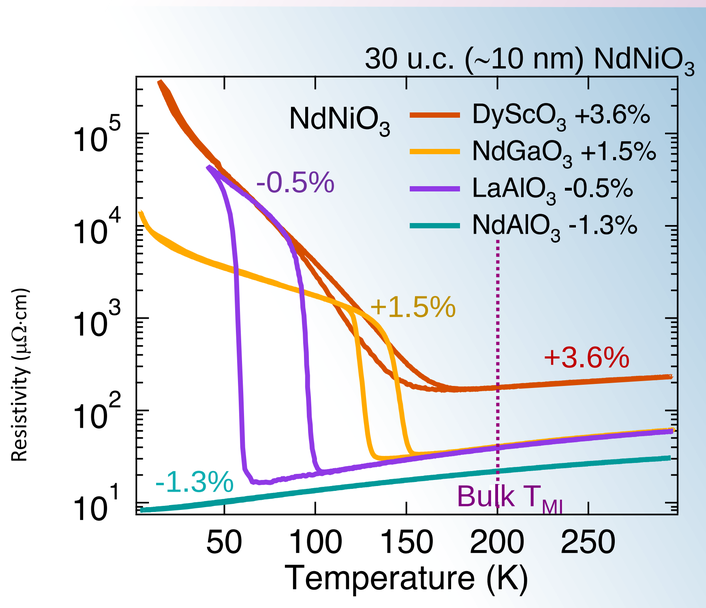




Superconducting QUantum Interference Device (SQUID) magnetometry







Strain-tuned Metal-to-insulator transitions

In-situ optical reflectivity

X-ray Absorption Spectroscopy (XAS)

X-ray Magnetic Circular Dichroism (XMCD)

Ongoing and future directions

- ❑ Growing **superlattices** of double perovskites that are predicted to be **multiferroic**
- ❑ Improving the magnetic properties of **ultrathin** double perovskite thin films
- ❑ Exploring **superconductivity** in hole-doped Nickelate-based heterostructures
- ❑ Following the oxide growth kinetics in **real time** using *in-situ* polarized optics