O 75: Topical Talk Bibes (joint session O/TT)

Time: Thursday 9:30–10:15 Location: TRE/PHYS

Topical Talk O 75.1 Thu 9:30 TRE/PHYS

Oxide interfaces as platforms for emergent quantum phenomena — •Manuel Bibes — Laboratoire Albert Fert, CNRS, Thales, U. Paris-Saclay, Palaiseau (France)

Oxide surfaces and heterointerfaces host electronic phases that emerge from the combined effects of broken inversion symmetry, orbital reconstruction, and electrostatic boundary conditions. In this overview, I will discuss how two-dimensional electron gases (2DEGs) formed at oxide surfaces and interfaces give rise to large and tunable spin-orbit interactions, interfacial magnetism, and ferroic control of transport properties.

The focus will be on Rashba-type spin-orbit coupling in oxide 2DEGs and its interplay with ferromagnetism and ferroelectricity, leading to effects such as electrically tunable Anomalous Hall effect, spin and orbital Edelstein effects, and spontaneous non-reciprocal charge transport. Angle-resolved photoemission spectroscopy (ARPES) and X-ray photoelectron spectroscopy (XPS) play a central role in elucidating the electronic structure, orbital character, and electrostatic landscape underlying these phenomena, and in establishing clear links between interface chemistry, symmetry breaking, and transport behavior.

Finally, I will discuss how these engineering 2DEGs enables new routes toward low-power spin-orbitronic and ferroelectric device concepts compatible with silicon technology. The talk will highlight open challenges and opportunities at the interface between surface science, correlated electron physics, and oxide electronics.