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Topological insulating phases in oxide multilayers using perovskites and rutiles[1] VICTOR PARDO, University Santiago de Compostela, JOSE L. LADO, Iberian Nanotechnology Laboratory, DANIEL BALDOMIR, University Santiago de Compostela — Ab initio calculations combined with tight-binding modelling have been performed[2] in 5d-electron-based perovskite multilayers in the large spin-orbit coupling limit. The topological properties of the systems $(SrTiO_3)_7/(SrIrO_3)_2$ and isoelectronic $(KTaO_3)_7/(KPtO_3)_2$ grown along the (111) direction have been analyzed as a function of on-site Coulomb repulsion U, parity asymmetry and uniaxial strain. The former is found to be a topological semimetal and the latter is a topological insulator describable as the high-U limit of the other one. This high-U phase can be driven to a trivial insulating phase by a perpendicular external electric field. In the talk, we will describe how to proceed in a similar way with rutile-based multilayered structures, where a 4d/5d electron dioxide with rutile structure, sandwiched by a band insulator like TiO_2 or SnO_2 can lead to topologically non-trivial properties if band filling and strain are tuned. We discuss also the possibility of obtaining similar topological states using isoelectronic fluorides. The electronic structure and properties of free-standing thin films will be also briefly discussed.

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[2]Phys. Rev. B 88, 155119 (2013).

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