

Novel Phenomena at Perovskite Interfaces

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We will discuss our recent research activities in ultra-thin, epitaxial, complex oxide thin films that exhibit electron-correlation-induced Mott metal-insulator transitions. We will discuss structures between band insulators and two fundamentally different correlated oxide thin film materials systems, the rare earth nickelates and the rare earth titanates. We show that novel heterostructures, such as $\text{GdTiO}_3/\text{SrTiO}_3$ and $\text{NdNiO}_3/\text{SrTiO}_3$, exhibit interesting phenomena, including interfacial conducting layers, charge transfer across interfaces and ferromagnetism. The presentation will also highlight the importance of materials quality in achieving the desired control over these phenomena as needed for novel electronic devices: similar to what has long been accepted in the semiconductor device community, only low-energetic deposition techniques, such as molecular beam epitaxy (MBE), can produce electronic device-quality materials. For example, we demonstrate record electron mobilities in SrTiO_3 thin films grown by MBE, which exceed even those of single crystals.