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Strongly Interacting Electrons at the Oxide Interfaces.[1]

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Utilizing the recent advances in complex oxide synthesis, one can now combine materials with antagonistic order parameters to create new compounds in the form of heterostructures often with properties not attainable in the bulk[1]. Broken symmetries, strain, and modified local environment at the interface provide a unique route to manipulate the subtle energy balance in correlated materials with promise to create novel material phases and quantum states. Here we report on how the interface can be used to alter electronic, magnetic and orbital structure of multilayers composed of late transition metal oxides with specific examples from cuprates, manganites and nickelates. We will discuss the underlying challenges in growth of ultra-thin layers of complex oxides and illustrate the ways synchrotron based resonant x-ray spectroscopies and resonant x-ray diffraction can be used to probe bulk vs. interface properties to gain unique insight into the underlying physics. J. Chakhalian et al, Science, v. 314, 1114, (2007).

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