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**New Optical Absorption Bands in Atomic Layer Superlattices**[1]

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Using atomic layer-by-layer molecular beam epitaxy, atomic layer superlattices can be constructed that exhibit new electronic, optical and lattice effects not present in the individual components. In particular, new optical transitions giving rise to sharp absorption peaks can be created by placing a layer of a material with occupied source states next to a layer of another material with unoccupied destination states. We combine atomic layers of $SrTiO_3$ and $LaMnO_3$ into superlattice structures with component layers as thin as single monolayer and find a new absorption band due to a transition from manganese- to titanium-derived states. The energy of the new transition depends on how the bands line up at the interface. Furthermore, a substantial shift of spectral weight occurs as well, while retaining a constant sum rule. This work was supported by the Department of Energy Basic Energy Sciences at the Fredrick Seitz Materials Research Laboratory, University of Illinois, Urbana. This work was done in collaboration with Xiaofang Zhai, Mao Zheng, Amish Shah, Chandra Mohapatra, and Jian-Min Zuo.

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