

Abstract Submitted
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Intentional cation intermixing at VO₂/TiO₂ interfaces: Why a metallic phase with V-V dimers can exist¹ LOUIS PIPER, NICHOLAS QUACKENBUSH, Binghamton University, HANJONG PAIK, DARRELL SCHLOM, Cornell University — In its bulk form, VO₂ displays an abrupt metal-to-insulator transition (MIT) accompanied by a structural phase transition involving the evolution of V-V dimers. One can modulate electron correlation effects by preferentially filling the d sub orbitals of VO₂ by growing epitaxial films on isomorphic TiO₂ substrates i.e. atomically abrupt interfaces. [1] Here we report our Synchrotron spectroscopy studies of intentional cation intermixing at the VO₂/TiO₂ interface. Although the resultant film was metallic with no evidence of a MIT, the V-V dimer intensity did vary with temperature i.e. a structural transition persisted. We explain our findings within a hole doping model, whereby the high concentration of Ti⁴⁺ ions replacing V⁴⁺ ions within the structure heavily reduces the V 3d electron count i.e. away from the Mott criterion. The fact that the distortion of the lattice is still thermodynamically favored at lower temperatures indicates that electron correlations are not a prerequisite for the structural phase transition of VO₂. [2] Taken together with our previous strain studies, [1] our data elegantly shows the importance of orbital occupancy on the MIT of VO₂. [1] Phys. Rev. B 93, 241110(R) (2016) [2] to be published (2016)

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