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Magnetism and electronic structure at the interface of a metal $CaRuO_3$ and Mott insulator $CaMnO_3$. ALEXANDER BORIS, MPI for Solids, JOHN FREELAND, JERALD KAVICH, ANL, HO NYUNG LEE, ORNL, PETAR YORDANOV, GINIYAT KHALIULLIN, BERNHARD KEIMER, MPI for Solids, JAK CHAKHALIAN, Univ. of Arkansas — Recent advances in fabrication of ultra-thin complex oxide heterostructures have opened new opportunities to investigate possible novel quantum states at the correlated interfaces. With this aim we fabricated ultra-thin superlattices of $CaMnO_3$(CMO)/$CaRuO_3$(CRO) with the thickness of CRO layers from 1 to 12 unit cells by laser MBE. Electronic properties of CRO/CMO were investigated by soft x-ray spectroscopies at the L-edges of Mn and Ru. SQUID and optical reflectivity revealed a ferromagnetic thickness-independent transition at $T_c \approx$100K and CRO thickness-dependent negative magnetoresistance. This behavior is in marked contrast to the individual layers. At the interface we found a clear sign of net magnetic moment on Mn, which saturates only at magnetic field of 5T. Unlike CMO, similar measurements at the Ru L_3-edge showed no detectable magnetism in the field up to 5T. Comparison with Ru references confirmed Ru(IV) oxidation state. These findings are in the sharp contrast with previously suggested models involving Ru(IV-V) valency exchange and thus reveal intricate nature of the interface between a metal and Mott insulator.

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