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**Controlling Emergent Ferromagnetism at Complex Oxide Interfaces**

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The emergence of complex magnetic ground states at $ABO_3$ perovskite heterostructure interfaces is among the most promising routes towards highly tunable nanoscale materials for spintronic device applications. Despite recent progress, isolating and controlling the underlying mechanisms behind these emergent properties remains a highly challenging materials physics problems. In particular, generating and tuning ferromagnetism localized at the interface of two non-ferromagnetic materials is of fundamental and technological interest. An ideal model system in which to study such effects is the $CaRuO_3/CaMnO_3$ interface, where the constituent materials are paramagnetic and antiferromagnetic in the bulk, respectively. Due to small fractional charge transfer to the $CaMnO_3$ (0.07 $e^-$/Mn) from the $CaRuO_3$, the interfacial Mn ions are in a canted antiferromagnetic state. The delicate balance between antiferromagnetic superexchange and ferromagnetic double exchange results in a magnetic ground state which is extremely sensitive to perturbations. We exploit this sensitivity to achieve control of the magnetic interface, tipping the balance between ferromagnetic and antiferromagnetic interactions through octahedral connectivity modification. Such connectivity effects are typically tightly confined to interfaces, but by targeting a purely interfacial emergent magnetic system, we achieve drastic alterations to the magnetic ground state. These results demonstrate the extreme sensitivity of the magnetic state to the magnitude of the charge transfer, suggesting the potential for direct electric field control. We achieve such electric field control through direct back gating of a $CaRuO_3/CaMnO_3$ bilayer. Thus, the $CaRuO_3/CaMnO_3$ system provides new insight into how charge transfer, interfacial symmetry, and electric fields may be used to control ferromagnetism at the atomic scale.