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Electric field tuning of the metal-magnetic transition in ionic liquid gated $Ca_3Ru_2O_7$ flakes CONOR PULS, XINXIN CAI, Physics Department, The Pennsylvania State University, JIN PENG, ZHIQIANG MAO, Physics Department, Tulane University, YING LIU, Physics Department, The Pennsylvania State University — The recent application of ionic liquids in electric field-effect devices has provided for unprecedentedly high surface charge accumulations ($\approx 10^{14}$ cm^{-2}) due to the formation of an electronic double layer at their interface with various materials. This technique provides a tool to explore metal-insulator transitions and superconductivity in various materials including transition metal oxides. We extend this technique to the study of the physics of strongly correlated electrons in complex oxides such as the Ruddlesden-Popper (R-P) series $Ca_{n+1}Ru_nO_{3n+1}$, where $n = 1$, 2, ... ∞. $Ca_3Ru_2O_7$, the $n = 2$ member of the R-P series, features antiferromagnetic ordering below 56 K and a first-order metal-insulator transition along with a structural transition at 48 K. We developed a technique for fabricating Hall bar devices on $Ca_3Ru_2O_7$ flakes prepared by mechanical exfoliation from bulk crystals, and performed low-temperature measurements using the ionic liquid DEME-TFSI in a top-gate configuration. We will discuss electrical transport results and the metal-magnetic transition with gate voltage tuning in these devices.

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