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Ballistic Hot Electron Transport in Heteroepitaxial $SrRuO_3$ Metal-Base Transistors BRIAN KIM, Stanford University, YASUYUKI HIKITA, SLAC National Accelerator Laboratory, TAKEAKI YAJIMA, The University of Tokyo, CHRISTOPHER BELL, University of Bristol, HAROLD HWANG, Stanford University — Perovskite oxide heterostructures is a rapidly emerging field significant for interface-induced electronic and magnetic reconstructions, resulting in novel phases distinct from those found in the bulk counterparts. Notably, utilizing device structures is an effective way to probe these interface-induced phases. One of the most prevalent device structures that has been adopted so far is a three-terminal field-effect geometry, used to probe in-plane electronic transport properties. However, the out-of-plane three-terminal device geometry, though less studied due to its complexity, is also useful in many aspects. In the metal-base transistor (MBT), for instance, ballistic transport of hot electrons injected across a Schottky diode emitter can be used to probe hot electron properties of the metal-base, providing information on inelastic scattering mechanisms, electron confinement effects, and intervalley transfer. One promising model system for the metal-base is $SrRuO_3$ (SRO), characterized by intermediate electron correlations with unusual transport properties. Here we present an all-perovskite oxide heteroepitaxial MBT using SRO as a metal-base layer. Successful MBT operation for various metal-base layer thicknesses was achieved, from which the hot electron attenuation length of SRO was deduced. These results form a foundation on which to examine the properties of hot electrons in strongly correlated systems using the out-of-plane three-terminal device geometry.

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