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Voltage-induced Metal-Insulator Transitions in Perovskite Oxide Thin Films Doped with Strongly Correlelated Electrons YUDI WANG, SOO GIL KIM, I-WEI CHEN, University of Pennsylvania — We have observed a reversible metal-insulator transition in perovskite oxide thin films that can be controlled by charge trapping pumped by a bipolar voltage bias. In the as-fabricated state, the thin film is metallic with a very low resistance comparable to that of the metallic bottom electrode, showing decreasing resistance with decreasing temperature. This metallic state switches to a high-resistance state after applying a voltage bias: such state is non-ohmic showing a negative temperature dependence of resistance. Switching at essentially the same voltage bias was observed down to 2K. The metal-insulator transition is attributed to charge trapping that disorders the energy of correlated electron states in the conduction band. By increasing the amount of charge trapped, which increases the disorder relative to the band width, increasingly more insulating states with a stronger temperature dependence of resistivity are accessed. This metal-insulator transition provides a platform to engineer new nonvolatile memory that does not require heat (as in phase transition) or dielectric breakdown (as in most other oxide resistance devices).

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