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Magnetic field dependence of the nonequilibrium metal-insulator transition in magnetite nanostructures[1] DOUGLAS NATELSON, Department of Physics and Astronomy, Rice University, ALEXANDRA A. FURSINA, Department of Chemistry, Rice University, R. G. S. SOFIN, IGOR V. SHVETS, School of Physics, Trinity College, Dublin, IE — At low temperatures magnetite undergoes a Verwey transition from a comparatively conducting state to a strongly correlated, ordered, more insulating state, the detailed nature of which remains under active debate. Recent experiments using nanostructures based on epitaxial magnetite films have shown that an applied dc electric field can lead to a nonequilibrium transition out of the insulating state. The kinetics of this nonequilibrium transition are nontrivial, with switching taking place over a distribution of applied voltages in a particular device at a given temperature below the Verwey transition. An externally applied magnetic field is observed to alter the kinetics of the nonequilibrium transition as the magnetization of the magnetite film is coerced out of plane. We present this data and discuss what it implies about the nature of the ordered, insulating ground state.

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