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Memristor Physics Driven by Joule Heating HAROLD HJALMARSON, MICHAEL MCLAIN, DENIS MAMALUY, XUJIAO GAO, Sandia National Laboratories — Switching in bipolar memristive devices involves the growth of conductive filaments following the application of a voltage pulse that causes heating. This Joule heating by the electric field is a large contributor to the migration of atoms and vacancies. In this talk, the results of continuum calculations will be used to describe the switching of tantalum oxide devices. The continuum calculations include the effects of Joule heating, chemical species migration, ionizing radiation and chemical reactions. These calculations will be focused on the temporal evolution of a conductive filament in a simple structure. Sandia National Laboratories is a multiprogram laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

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