Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Thermophoresis (Soret Effect) in Memristor Calculations
HAROLD HJALMARSON, PATRICK MICKEL, GAD HAASE, ANDREW LOHN, MATTHEW MARINELLA, MICHAEL MCLAIN, Sandia National Laboratory, ANDREW PINEDA, Air Force Research Laboratory — Switching in memristive devices involves the formation of conductive filaments following the application of a voltage pulse that causes heating. The temperature gradient may cause migration of atoms and vacancies through thermophoresis, also called the Soret effect or thermal diffusion. Thus thermophoresis may contribute to the switching mechanism. In this talk, the inclusion of thermophoresis in continuum calculations of electrical transport will be discussed in terms of nonequilibrium thermodynamics. These calculations include the effects of Joule heating, chemical species migration, ionizing radiation and chemical reactions. The merits of various ways to include thermophoresis will be discussed. Some illustrative results will also be discussed. Sandia National Laboratories is a multi-program 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.

Harold Hjalmarson
Sandia National Laboratory

Date submitted: 12 Nov 2012 Electronic form version 1.4