Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Measurement of resistance switching dynamics in copper sulfide memristor structures KAITLIN MCCREERY, MATTHEW OLSON, STEPHEN TEITSWORTH, Duke University — Resistance switching materials are the subject of current research in large part for their potential to enable novel computing devices and architectures such as resistance random access memories and neuromorphic chips. A common feature of memristive structures is the hysteretic switching between high and low resistance states which is induced by the application of a sufficiently large electric field. Here, we describe a relatively simple wet chemistry process to fabricate Cu_2S/Cu memristive structures with Cu_2S film thickness ranging up to 150 micron. In this case, resistance switching is believed to be mediated by electromigration of Cu ions from the Cu substrate into the Cu_2S film. Hysteretic current-voltage curves are measured and reveal switching voltages of about 0.8 Volts with a relatively large variance and independent of film thickness. In order to gain insight into the dynamics and variability of the switching process, we have measured the time-dependent current response to voltage pulses of varying height and duration with a time resolution of 1 ns. The transient response consists of a deterministic RC component as well as stochastically varying abrupt current steps that occur within a few microseconds of the pulse application.

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Date submitted: 11 Nov 2016 Electronic form version 1.4