Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Resistive Switching and Temperature-dependent Transport in HfOx-based Resistive Memory Devices SEYOUNG KIM, IBM T J Watson Research Center, CHIYUI AHN, Stanford University, TAYFUN GOKMEN, OLIVER DIAL, MARK RITTER, IBM T J Watson Research Center — Resistive switching phenomenon in transition metal oxide materials has been studied intensively as a candidate technology for future non-volatile memory applications and electronic synapse devices. Here, we demonstrate an HfOx-based resistive memory device with rare earth metal contact in which the device resistance can be modulated with applied voltage and current. Repeatable and self-compliance switching as well as high yield and device-to-device uniformity are achieved in our devices. To understand the conduction mechanism, we perform transport measurement in multiple devices at different resistance states (initial, low and high resistance states) by probing current as a function of applied voltage at temperatures from 40K to 350K. We find that temperature insensitive tunneling conduction dominates at low temperature, while thermally activated conduction is observed at high temperature. Trap-assisted tunneling and Poole-Frenkel mechanisms are accounted for the characteristics found in different regimes.

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Date submitted: 18 Nov 2013 Electronic form version 1.4