Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Total Ionizing Dose (TID) Effects of γ Ray Radiation on Ag/AlO_x/Pt Resistive Switching Memory[1] FANG YUAN, ZHIGANG ZHANG, SHANSHAN SHEN, LIYANG PAN, JUN XU, Tsinghua University, MEMORY RESEARCH TEAM — The TID effects of γ rays generated from a ^{60}Co source on the Ag/AlO_x/Pt resistive switching (RS) memory is studied. Memory performances, including initial resistance state (IRS), low/high resistance state (LRS/HRS), forming voltage (V_f), switching voltage (V_{set}/V_{reset}) and retention reliability are examined on the memory devices before and after exposure to 1M rad (Si) radiation. The LRS is robust to the radiation whereas a little degeneration of uniformity is found in IRS and HRS, which is caused by the radiation induced defects (mainly holes), trapped in the oxide. For the same reason, V_f increases several multiples after radiation. However surprisingly, both V_{set} and V_{reset} decrease during the RS and the retention performance is greatly improved. Based on these TID effects, it is proposed that the RS mechanism in Ag/AlO_x/Pt, Ag conducting filament based switching, may be reinforced through γ radiation, which assists in stabilizing the growth/rupture of Ag filaments. The high radiation tolerance of AlO_x-based RS memory devices suggests a potential for aerospace and nuclear applications.

[1]Supported by the National Natural Science Foundation of China (20111300789).

Fang Yuan
Tsinghua University

Date submitted: 31 Dec 2013 Electronic form version 1.4