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Electric Field Induced Resistive Switch in Transition Metal Oxides: A "Model" for Future Non-Volatile Memory Devices NILANJAN DAS, YUYI XUE, YA-QI WANG, C.W. (PAUL) CHU, University of Houston — The kinetics of resistive switching in metal (Ag)–$Pr_{0.7}Ca_{0.3}MnO_3$ interfaces has been investigated. The resistance hysteresis ΔRvaries with the pulse amplitude V_0 roughly as a step function with existence of a threshold voltage V_t. On the other hand, the ΔRvaries with the pulse width (T_w) as a two-stage sequence: an initial exponential rise with a time constant $\tau_S \approx 2$ X10^7 s and a slow linearly increasing tail. The slow linear part is dominant only in the quasi-dc switch (pulse width $\sim$ a few seconds) below V_t. The retentions of the ΔRcorresponding to the two stages are also extremely different, indicating that different underlying processes are involved. The relaxation time (τ_R) is 10^8 s ($\sim$year) or higher for the sub-μs switching, in strong contrast with the total disappearance of the ΔRafter a few days for sub-threshold ($V_0 << V_t$) switch. More results obtained suggest that defect creation/annihilation is likely the mechanism for the sub-μs switching and that a slow accumulative process (like diffusion) of defects may be responsible for the quasi-dc switch.

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