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Electric Field Induced Sub-Microsecond Resistive Switching NILANJAN DAS, STEPHEN TSUI, YA-QI WANG, YUYI XUE, CHING-WU (PAUL) CHU, University of Houston — Electric field induced resistive switching in metal-oxide interfaces has attracted extensive recent interest. While many agree that lattice defects play a key role, details of the physical processes are far from clear. There is debate, for example, regarding whether the electromigration of pre-existing point defects or the field-created larger lattice-defects dominates the switch. We investigate several Ag-$Pr_{0.7}Ca_{0.3}MnO_3$ (PCMO) samples exhibiting either sub-microsecond fast switching or slow quasistatic DC switching. It is found that the carrier trapping potentials are very different for the pre-existing point defects associated with doping (and/or electromigration) and the defects responsible for the sub-μs fast-switching. Creation/removal of the defects with more severe lattice-distortions and spatial spreading (trapping potential ≥ 0.35 eV), therefore, should be the dominating mechanism during sub-μs switching. On the other hand, the shallow defects (trapping potential $<< 0.2$eV) associated with doping/annealing are most likely responsible for the resistance hysteresis (slow switch) during quasistatic voltage sweep.

Nilanjan Das
University of Houston

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