

**Stony Brook University  
The Graduate School**

Doctoral Defense Announcement

**Abstract**

Experimental Study of Transport through Few-nm Metal Oxide Tunnel Barriers

By

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We have studied resistive bistability (memory) effects in junctions based metal oxides, with a focus on sample-to-sample reproducibility which is necessary for the use of such junctions as crosspoint devices of hybrid CMOS/nanoelectronic circuits. Few-nm-thick layers of  $\text{NbO}_x$ ,  $\text{CuO}_x$  and  $\text{TiO}_x$  have been formed by thermal and plasma oxidation, at various deposition and oxidation conditions, both with or without rapid thermal post-annealing (RTA). The resistive bistability effect has been observed for all these materials, with particularly high endurance (over  $10^3$  switching cycles) obtained for single-layer  $\text{TiO}_2$  junctions, and best reproducibility, for multilayer junctions of the same material. Fabrication optimization has allowed us to improve the ON/OFF conductance ratio to about  $10^3$ , but the sample-to-sample reproducibility is so far lower than that required for large scale integration.

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**Place:** Physics Building, Room B131

**Program:** Physics

**Dissertation Advisor:** Konstantin Likharev