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Study of the Filament Evolution in TiO_2 Resistive Switching Device by Schottky Junction Analysis[1] TRITHEP DEVAKUL, BADIH A. ASSAF, Department of Physics, Northeastern University, PEGAH M. HOSSEINPOUR, LAURA H. LEWIS, Department of Chemical Engineering, Northeastern University, DON HEIMAN, Department of Physics, Northeastern University — Resistive switching in TiO_2-based metal-dielectric-metal devices is thought to be driven by the dynamics and evolution of oxygen deficient conducting filaments through the bulk of TiO_2 [1]. We present an analysis of the resistive switching characteristics of Ti/TiO_2/Au devices grown by anodizing Ti on Si and Ti foil. The device is SET and RESET by increasing the switching voltage in small steps. Current-voltage data is obtained at low voltages at each step and analyzed using the Simmons model for thermionic emission of electrons over an energy barrier. The energy barrier consists of an insulating TiO_2 barrier sandwiched between an electrode and an oxygen deficient TiO_x filament. The IV fits yield information about the height and width of the energy barrier. In the low resistance state, we find that the barrier width becomes wider, but this is overcome by a lower barrier height. The observed results can be explained by a model in which a field-driven migration of oxygen vacancies [2] modulates the Schottky barrier height and width.

[1] D-H. Kwon et al, *Nature Nanotechnology* **5**, 148-153 (2010)
[2] K. J. Yoon et al, *Nanotechnology* **23**, 185202 (2012)

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Trithep Devakul
Department of Physics, Northeastern University

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