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**Shock wave mechanism for bipolar resistive switching** S. TANG, V. DOBROSAVLJEVIĆ, Florida State University, M. ROZENBERG, Univ. de Paris, Orsay — Many recently discovered systems displaying resistive switching phenomena have been widely studied as potential basis of future electronic memory devices. The hysteresis cycles observed in several such transition-metal oxide devices show a universal feature related to an abrupt onset of resistance switching. Here, we present an analytic analysis of a recently proposed phenomenological model[1], via first principle derivation of an appropriate non-linear diffusion equation describing the rapid oxygen vacancy migration under strong time-dependent external electric fields. The non-linearity effect, which reflects the vacancy concentration dependence of the local resistivity, can be related to the modified Burger's equation describing shock waves. We show that the sudden resistance drop observed in the numerical solution of the model occurs exactly when the vacancy shock wave front reaches the interface between the highly resistive Schottky barrier and the bulk. We argue that the magnitude of the relevant nonlinear term is maximal for materials in the close-vicinity of the metal-insulator transition; this insight may facilitate the the optimization of device performance.

[1]M. J. Rozenberg *et al.*, Phys. Rev. B **81**, 115101 (2010).

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