Abstract Submitted
for the GEC18 Meeting of
The American Physical Society

Metal-Insulator Transition in Vanadium Dioxide Triggered by a Pulsed Plasma OLUWAYEMISI SONOIKI, ANDREY MIRONOV, SACHA JUNGERMAN, JAMES EDEN, Univ of Illinois - Urbana — Vanadium dioxide (VO_2) is a Peierls-Mott insulator that undergoes a change from an insulating to a metallic state at 341 K, accompanied by a structural transition from monoclinic to rutile phase. A pulsed plasma-driven metal-insulator transition (MIT) in thin thermochromic VO_2 films has now been observed. In these VO_2 low-temperature plasma devices, the transition occurs as a result of the strong electric field in the cathode sheath of the gas-phase plasma. Ko *et al.* previously showed a non-plasma-based electric field-assisted phase transition with fields around 10^7 V/m [1], and calculations by Hormoz *et al.* to estimate the critical field required for transition via a Poole-Frenkel mechanism supported these results [2]. The magnitude of this required field is identical to those in the cathode fall region of some plasma devices fabricated at the University of Illinois for applications like a plasma transistor where the strong sheath field is capable of reverse-biasing the collector-base junction. Optical and electrical investigation across the MIT would be presented in this new method of MIT-triggering in the magnetron-sputtered correlated oxide. [1] Ko, C., & Ramanathan, S. (2008). Observation of electric field-assisted phase transition in thin film vanadium oxide in a metal-oxide-semiconductor device geometry. Applied Physics Letters, 93(25). [2] Hormoz, S., & Ramanathan, S. (2010). Limits on vanadium oxide Mott metal-insulator transition field-effect transistors. Solid-State Electronics, 54(6), 654–659.

Oluwayemisi Sonoiki
Univ of Illinois - Urbana

Date submitted: 12 Jun 2018 Electronic form version 1.4