Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Role of joule heating in electrically-driven metal insulator transition in vanadium oxide nanowires SUJAY SINGH, ZHENZHONG SHI, CHUN PUI KWAN, Department of Physics, PETER MARLEY, SARBAJIT BANERJEE, Department of Chemistry, GANAPATHY SAMBANDAMURTHY, Department of Physics, University at Buffalo, Buffalo, NY 14260 — Metal to insulator transition (MIT) in vanadium oxide system can be triggered by several external stimuli such as temperature, electric field, strain and light. Electrically driven MIT in single nanowire devices of crystalline vanadium oxide (W- doped VO_2, Ag-doped V_2O_5) is the topic of current study. Recent works on realizing switching devices using these materials have discussed the importance of Joule heating near the transition as supposed to a purely electric field induced effect. We propose a novel method for identifying the individual roles of Joule heating and/or electric field by analyzing the frequency response of the AC electric signal near the MIT in these devices. The method may also be used in other strongly correlated electron system to delineate the roles of individual microscopic conduction mechanisms near MIT.

Sujay Singh
Department of Physics, University at Buffalo, Buffalo, NY 14260

Date submitted: 17 Dec 2012 Electronic form version 1.4