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Electric field effects on phase transition and electronic transport mechanisms in vanadium oxide thin films[1] CHANGHYUN KO, SHRIRAM RAMANATHAN, Harvard University — Metal-insulator transitions (MIT) in complex oxide thin films are of great interest from both scientific and application perspectives. Vanadium oxide is a model system to exploit strongly correlated electronic phenomena such as Mott transition. Furthermore wide attention for application has been attracted by its transition functionality that can be tuned in terms of various external parameters: temperature, electric field, photoexcitation, and stress. The tunable conduction states allow creating novel devices whose functions are controlled by multiple parameters. We report on recent observations of electric-field assisted phase transition in vanadium oxide thin films. The conduction mechanisms were analyzed using both in-plane and out-of-plane modes and matched well. In the insulator phase, Poole-Frenkel emission was suggested to govern non-ohmic behavior at high field regime, while under low field application, ohmic conduction with activation energy of $\sim$0.24 eV was observed. Activation energy of ohmic conduction in the metallic phase was $\sim$0.08 eV. These preliminary results are encouraging towards exploring correlated oxides for computing device technologies.

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