Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Correlation between metal-insulator transition characteristics and electronic structure changes in vanadium oxide thin films D. RUZMETOV, V. NARAYANAMURTI, S. RAMANATHAN, SEAS, Harvard University, Cambridge, MA, S.D. SENANAYAKE, CSD, Oak Ridge National Lab, Oak Ridge, TN — We correlate electron transport data with energy band structure measurements in vanadium oxide thin films with varying V-O stoichiometry across the VO_2 metal-insulator transition (MIT). A set of vanadium oxide thin films were prepared by reactive DC sputtering from a V target at various oxygen partial pressures resulting in films with different MIT strength as determined from the electrical resistance measurements. The results of the near edge X-ray absorption fine structure spectroscopy (NEXAFS) of the O K-edge in identical VO films are presented. Redistribution of the spectral weight from σ^* to π^* bands is found in the vanadium oxide films exhibiting stronger VO_2 MIT. This is taken as evidence of the strengthening of the metal-metal ion interaction with respect to the metal-ligand and indirect V-O-V interaction in vanadium oxide films featuring sharp MIT. We observe also a clear correlation between MIT and the width and the area of the lower π^* band which is likely to be due to the emergence of the $d_{||}$ band overlapping with π^*. The strengthening of this $d_{||}$ band near the Fermi level only in the vanadium oxide compounds displaying the MIT points out the importance of the role of the $d_{||}$ band and electron correlations in the phase transition.

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Date submitted: 19 Dec 2007 Electronic form version 1.4