Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

X-ray absorption spectroscopy studies of Vanadium dioxide thin films across the metal-insulator phase transition boundary DMITRY RUZMETOV, SHRIRAM RAMANATHAN, DEAS, Harvard University, Cambridge, MA, SANJAYA D. SENANAYAKE, CSD, Oak Ridge National Lab, Oak Ridge, TN — X-ray absorption (XAS) and photoemission (XPS) spectroscopy of the V 2p edges and O 1s edge was performed on VO_2 thin films synthesized by RF sputtering at various conditions. Distinct changes of the electronic structure depending on the film quality, whether the sample is above or below the metal insulator transition (MIT) temperature, and thermal history of the sample are observed. The spacing between $3d_\pi$ and $3d_\sigma$ band peaks probed by O- edge XAS decreases by 0.8eV with concurrent peak broadening for the sample sputtered at lower substrate temperature and consequently having more polycrystalline and disordered character. There is a similar tendency in the V $2p_{3/2}$ and $2p_{1/2}$ edges, i.e. the convergence of the doublets for the disordered sample. The temperature dependence of the XAS V and O edges including repeated crossing of the MIT has been studied. The reversible switches of the $3d_\pi$ and $3d_\sigma$ band peak widths in the O-edge on different sides of the MIT are measured while the peak separation remains the same. The abruptness of the band structure transformation at MIT suggests that the band width changes are determined by the VO_2 MIT phase rather than gradual evolution with temperature.

Dmitry Ruzmetov
DEAS, Harvard University, Cambridge, MA

Date submitted: 17 Nov 2006 Electronic form version 1.4