Contribution ID: **41** Type: **Poster**

Angle-resolved photoemission on metallic and insulating phase of VO2

Monday, 23 July 2012 20:00 (2 hours)

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Although vanadium dioxide (VO2) has captured the attention of physicists for several years due to its characteristic metal-insulator transition (MIT) above room temperature, there are at present no data published from angle-resolved photoemission (ARPES) experiments. Indeed, ARPES on VO2 has traditionally been hindered by the quality of cleaved single crystals, and the lack of a clear MIT in low photon energy measurements has even lead to the assumption of a surface region with a different electronic structure. We have grown VO2(001) epitaxial films on TiO2 with the new in situ pulsed-laser-deposition (PLD) system available on the MAESTRO beamline at the Advanced Light Source, and we show that the MIT is clearly visible for photon energies within the UV range. We have been able to measure the band dispersion above and below the transition temperature, and discuss our results in comparison with LDA and cluster-DMFT calculations. In addition, we present the evolution of the electronic structure upon W substitutional doping of the VO2 films, which leads to a peculiar phase diagram (Appl. Phys. Lett. 96, 022102 - 2010) where the transition is quenched and then reappears for increasing W content.

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Session Classification: Poster Session 1

Track Classification: Metal-Insulator Systems