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Probing the Reversible Changes in Electronic Structure Induced by Liquid Electrolyte Gating in WO_3 Thin Films by Hard X-ray Photoelectron Spectroscopy JULIE KAREL, CARLOS VIOL BARBOSA, Max Planck Institute for Chemical Physics of Solids, SIMONE ALTENDORF, IBM Almaden Research Center, JANOS KISS, YUKI UTSUMI, Max Planck Institute for Chemical Physics of Solids, MAHESH SAMANT, IBM Almaden Research Center, LIU HAO TJENG, CLAUDIA FELSER, Max Planck Institute for Chemical Physics of Solids, STUART PARKIN, IBM Almaden Research Center — Tungsten trioxide (WO_3) is a d^0 transition metal oxide that has attracted broad interest from both application and fundamental materials physics standpoints. It has been studied for use in photoelectrochemical hydrogen generation, smart windows, gas sensors and has been shown to exhibit high temperature surface superconductivity when doped with K or Cs. Many of these studies necessitate modifications in the carrier concentration and in particular oxygen deficiencies. In this work, we utilize liquid electrolyte gating to create oxygen vacancies in WO_3 thin films, a process we will show is reversible. The modifications in the electronic structure (core levels and valance band) resulting from the gating are probed by hard X-ray photoelectron spectroscopy. Electrolyte gating leads to a significant population of W 5d states in the conduction band and an enormous change in the W 4f core levels. *Ab initio* density functional theory is used to help describe the origin of these modifications in the electronic structure.

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