O 70: Poster Oxides and Insulator Surfaces: Adsorption and Reaction of Small Molecules

Time: Wednesday 18:00–20:00 Location: P2

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Nitrogen Doping of Cuprous Oxide Films: A Surface Science Perspective — Mina Soltanmohammadi and •Niklas Nilius — Carl-von-Ossietzky University, Institute of Physics, D-26111 Oldenburg, Germany

Nitrogen doping of Cu_2O films grown on Au(111) and Pt(111) supports was explored by a variety of surface-science techniques, including electron-diffraction, X-ray photoelectron-spectroscopy (XPS), scanning tunneling microscopy and photoluminescence spectroscopy (PL). The films were prepared by Cu vapor deposition and high-pressure oxidation at 50 mbar O_2. Nitrogen was inserted by adding N_2 to the reactive gas or via sputter doping. Only the latter resulted in a clear N1s signal in XPS, compatible with the insertion of N-atoms at O substitutional sites. The N-doping caused an overall degradation of the oxide lattice and suppressed the formation of the $(\sqrt{3} \times \sqrt{3})R30°$ surface reconstruction observed on pristine $Cu_2O(111)$. Moreover, the oxide Fermi level shifted from the valence-band top into the band gap, indicative for a reduced p-type conductivity of the sample upon doping. The N-dopants featured low thermal stability and largely desorbed at 500 K, leaving behind a pronounced 850 nm PL peak due to O vacancy emission. Our findings indicate that the N-atoms initially occupy O substitutional sites but get removed easily at moderate temperature, casting doubts whether N-doping is a suitable pathway to improve the conductance and luminescence behavior of Cu_2O.