Water adsorption on the hydroxylated H-(1 × 1) O-ZnO(000-1) surface†

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The adsorption of water multilayers on a well defined single crystal, hydroxyl-terminated ZnO-surface, H(1 × 1)-O-ZnO(000-1) surface has been investigated using infrared (IR) spectroscopy, helium atom scattering (HAS) and X-ray photoelectron spectroscopy (XPS). The results reveal the formation of well ordered mono-, bi- and multilayers of D_2O and H_2O on this substrate. On the bare hydroxyl-covered H(1 × 1) surface the OH-stretch vibration could be clearly identified in the IR-spectra. The water adsorption and desorption kinetics on this hydroxylated surface were studied by monitoring the reflectivity of the surface for helium atoms. The analysis of the data yielded activation energies for desorption of H_2O from the H(1 × 1) O-ZnO surface of 55.2 kJ mol^{-1}. The results reveal the formation of ordered mono- and bilayers. Further exposure to water at 113 K results in the formation of amorphous 3-D islands.