SO_2 ADSORPTION ON RU(100) SURFACES STUDIED BY VIBRATIONAL SPECTROSCOPY

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The adsorption of SO_2 on Ru(100) surfaces has been studied in the temperature range between 110 K and 370 K mainly by means of high resolution electron energy loss spectroscopy (HREELS) motivated by its relevance for the solution of environmental problems and its importance for the characterization of electrochemical double layers in H_2SO_4 solutions. The identification of the adsorbed species and the determination of their geometric bonding configuration is accomplished using isotopically labelled $S^{16}O_2$ and $S^{18}O_2$ and applying surface dipole selection rules, respectively. For reference purposes $^{16}O_2$, $^{18}O_2$ and SO_3 were adsorbed, as well. The Ru(100) surface reacts readily with SO_2 even at 110 K. In addition to molecular SO_2 reaction products such as S, O, SO_3, and SO_4 can be observed in the first adsorbed layer distinguished by their vibrational signature. In addition their bonding configurations can be determined from the observed dipole active modes. Subsequent SO_2 adsorption leads to a condensation of molecular SO_2. Annealing results in the desorption of molecular SO_2 and a further decomposition of the adsorbed species. Thereby the thermal stability of adsorbed SO_3 and SO_4 is higher compared with chemisorbed SO_2. After annealing to 300 K O-coordinated SO radicals with C_s symmetry can be identified in contrast to S-S chains or complexes of atomic S and O, as proposed on the basis of XPS [1]. Upon further heating to 370 K the SO radicals dissociate into atomic S and O.

1. T. Jirsak, J.A. Rodriguez, S. Chaturvedi and J. Hrbek, Surface Science **418**(1998)8