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# Acid-Base chemistry at solid-gas interfaces

## Content

Cloud formation, atmospheric chemistry, and human health are influenced by multiphase chemistry at the interface of atmospheric particles and ground surfaces with air (Pöschl and Shiraiwa 2015). All of these impacts are affected by acidity (Angle et al. 2021, Tilgner et al. 2021). A conceptional understanding of interfacial acid-base character has not yet been reached (Saykally 2013). Using XPS, we have suggested that the dissociation of acids adsorbed to ice is governed by the availability and mobility of water molecules to stabilize the dissociated ions and that the degree of dissociation at the air-ice interface differs from that predicted based on dissociation behavior in aqueous bulk solutions (Krepelova et al. 2013, Kong et al. 2017). Ice and snow host chemistry of relevance for the atmosphere and are of importance in cold regions of the Earth (Thomas et al. 2019).

Here, we present new near ambient pressure photoemission data on the dissociation of acetic acid adsorbed to ice with a low surface coverage at -25℃ and -55℃. Changes in the dissociation degree are discussed and related to the structure of the hydrogen bonding network at the air-ice interface. For this, X-ray absorption spectra are presented that allow the identification of quasi-liquid features in the hydrogen bonding network that arises with increasing temperature (Bluhm et al. 2002). The results of these experiments are compared to data from photoemission experiments of acidic trace gases adsorbed to the mineral oxide surfaces MgO and SiO2. Mineral oxides are often classified based on their Brønsted acidity as neutral (SiO2) and basic (MgO). With relevance to the atmosphere, Goodman et al. (2001) and Fang et al. (2016) have shown that the strong acid nitric acid adsorbs molecularly on SiO2. Here, we present data on the dissociation of nitric acid at varying humidity.

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