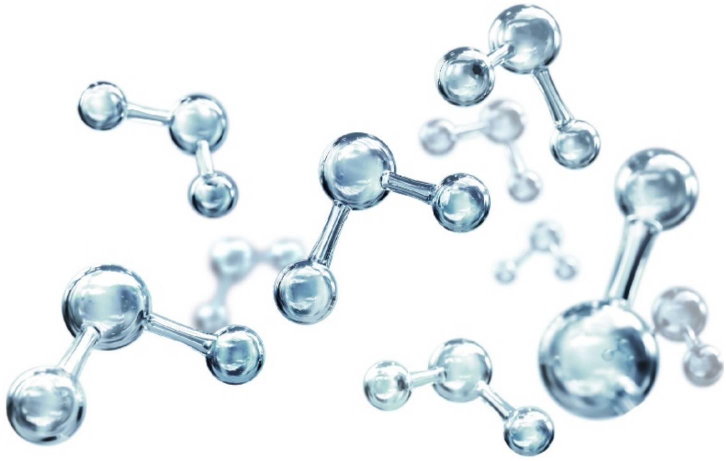
Seminar

Centre for Molecular Water Science

8th of July 2021
12:00 h

Zoom Virtual Meeting:
https://desy.zoom.us/j/97518013893
Meeting-ID: 975 1801 3893
Password: 320247



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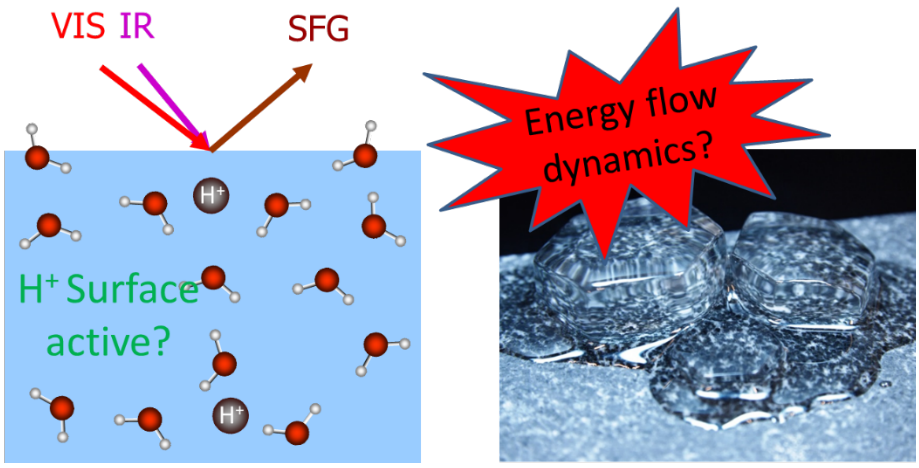
The surface of ice, liquid water, and acidic water

The structure and dynamics of interfacial phenomena is not only interesting from a fundamental point of view, but also relevant for many atmospheric, geochemical, and electrocatalytic processes. In the first part of the talk, we will look into the behaviour of hydroxide and hydrated protons, the auto-ionization products of water. By using the surface-sensitive vibrational sum frequency generation spectroscopy – basically providing the vibrational spectrum of just the interfacial layer – on the O-H stretch region, the onset concentration of surface adsorption at the water-air surface of hydrated protons and hydroxide ions can be determined. As such the relative surface-activity has been obtained [1]. Moreover, changes in the spectral signature of the so-called free OH molecule sticking out in the air are used to determine the adsorption free energy of the proton [2]. In the second part of the talk we will look into vibrational energy dynamics on the surface of ice, potentially important for atmospheric chemistry where reactions are taking place on the ice surface. A comparison to liquid water surfaces, reveals accelerated vibrational energy relaxation and dissipation at the ice surface for hydrogen-bonded OH groups. In contrast, free-OH groups sticking into the vapor phase exhibit substantially slower vibrational dynamics on ice [3]. The results will be related to the structural differences between ice and water and to the high catalytic activities of ice.



[1] S. Das, M. Bonn, E.H.G. Backus, Angew. Chem. Int. Ed. 58 (2019) 15636
[2] S. Das, S. Imoto, S. Sun, Y. Nagata, E.H.G. Backus, M. Bonn, J. Am. Chem. Soc. 142 (2020) 945
[3] P. Sudera, J.D. Cyran, M. Deiseroth, E.H.G. Backus, M. Bonn, J. Am. Chem. Soc. 142 (2020) 12005