Spectroscopy and Photoscience Lectures

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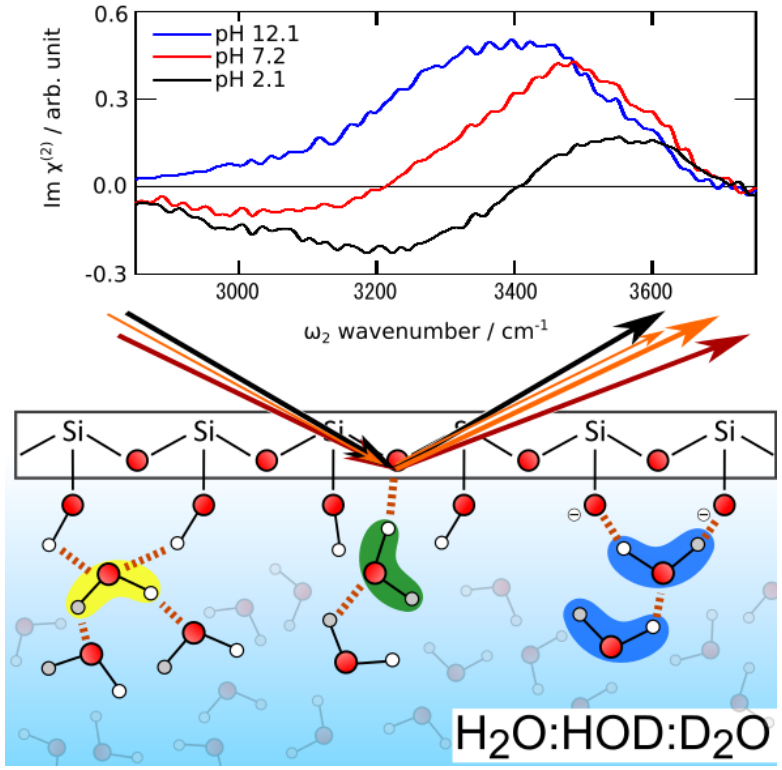
Title: Exploring the Molecular Structure and Orientation at the Solid/Liquid Interface by Heterodyne-Detected Vibrational Sum Frequency Generation Spectroscopy

Time: 2016/7/7, 14:30 – 15:30

Place: Rm. 5134



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Abstract: Solid/liquid interfaces, such as glass/water or polymer/water, are important in many natural and industrial processes. However, it is difficult to characterize such interfaces by conventional spectroscopic methods, since they are "buried" between two bulk phases. Heterodyne-detected vibrational sum-frequency generation (HD-VSFG) spectroscopy is intrinsically interface selective, which allows us to selectively study interfacial molecules without any contributions from the bulk. In the last years, HD-VSFG spectroscopy has been successfully used to study the water structure at the air/liquid interface. [1] However, application of HD-VSFG to the buried interface was prevented by technical difficulties, in particular the lack of a suitable reference, until now.

I will present the application of HD-VSFG spectroscopy to the buried silica/water interface as a model system of the solid/liquid interface. [2] By varying the pH of the bulk water solution the surface charge density at the silica/water interface was changed. Negatively charged silica surface at high pH, lead to net H-up orientation of water molecules at the silica/water interface. At low pH, where the silica surface is neutral, two water species were distinguished, one showing H-up and one showing H-down orientation. This is consistent with water molecules forming hydrogen bonds to the silanol groups on silica surface and bulk water molecules, respectively.

Further, I will discuss the molecular structure and orientation at different polymer/water interfaces, based on HD-VSFG experiments. [3]

References:

[1] Nihonyanagi, S.; Mondal, J.; Yamaguchi, S.; Tahara, T., Ann. Rev. Phys. Chem., **2013,** *64,* 579.
[2] Myalitsin, A.; Urashima, S.; Nihonyanagi, S.; Yamaguchi, S.; Tahara, T.; J. Phys. Chem. C, **2016**, 5, 9357.
[3] Myalitsin, A.; Nihonyanagi, S.; Yamaguchi S.; Yanagisawa, J.; Aoki, T.; Tahara, T.; *in preparation*.