Vibrational dynamics of interfacial water revealed by 2D HD-VSFG spectroscopy

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Heterodyne-detected vibrational sum-frequency generation (HD-VSFG) spectroscopy is a powerful technique to study liquid interfaces [1]. This interface-selective nonlinear spectroscopy enables us to directly measure the imaginary part of the second-order susceptibility ($\mathrm{Im}\chi^{(2)}$) that is the direct interfacial counterpart of infrared and Raman spectra in the bulk. A critical advantage of the $\mathrm{Im}\chi^{(2)}$ spectra is that they are linear to the molecular response and hence the spectrum is the simple sum of the constituent components. This characteristic enables us to obtain time-resolved spectra that can be interpreted straightforwardly [2].

We realized infrared-excited time-resolved HD-VSFG and 2D HD-VSFG at aqueous interfaces for investigating vibrational dynamics of interfacial water molecules. In this talk, I will discuss about what we have learned for the dynamic properties of interfacial water, focusing on the water at the charged interfaces [3-5].

References

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