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Water at surfaces with tunable surface chemistries and the chiral imprint of water around DNA.[1]

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Aqueous interfaces are ubiquitous in atmospheric chemistry and biological systems but are notoriously hard to probe experimentally. Surface-specific vibrational spectroscopy offers an avenue to directly probe the vibrational modes of the water OH stretching band but this method is challenging to implement to buried surfaces. Here we present results from sum-frequency generation (SFG) spectroscopy probing the buried interface between a functionalized surface and aqueous solutions. Studying such buried surfaces offers the advantage of being able to systematically tune the surface chemistry using self-assembled monolayers, i.e. the hydrophobic and hydrophilic character, and examine the effect on the interfacial water. In addition to water at these controlled surfaces, we have initiated studying water at biological surfaces. This includes the solvation structure around DNA. X-ray experiments at cryogenic temperatures have found crystallographic water in the minor grove of DNA giving rise to the notion of a spine of hydration surrounding DNA. Such structured water should exhibit a chiral structure adapted from DNA. We investigate if such a chiral water structure exist around DNA at room temperature using chiral SFG.

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