

Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Orientational dynamics of water at an extended hydrophobic interface¹ FLORIAN FIGGE, SHUNHAO XIAO, JOHN A. MCGUIRE, Department of Physics and Astronomy, Michigan State University, GUILLAUME STIRNEMANN, Institut de Biologie Physico-Chimique, Univ. Paris Diderot, DAMIEN LAAGE, Département de Chimie, École Normale Supérieure — Aqueous interfaces are central to many physical processes, but the dynamics of interfacial water molecules have been little studied. We have measured the orientational dynamics of water at its interface with a self-assembled monolayer of octadecylsilane on fused silica. A surface-sensitive sum-frequency probe generated by mixing a visible and a vibrationally resonant infrared (IR) pulse is used to monitor the dangling (non-hydrogen-bonded) OH stretch vibration after excitation with a resonant IR pump pulse. By measuring pure and isotopically diluted water with orthogonal pump polarizations, we find that relaxation of the dangling OH stretch excitation is dominated by the out-of-plane jump from a dangling to a hydrogen-bonded configuration and the subsequent redistribution of energy from the surface hydrogen-bonded OH stretch excitation. The out-of-plane jump time is 1.5(1)ps, 30% slower than that reported for the air-water interface and twice as short as the jump time between hydrogen bonded configurations in the bulk. Molecular dynamics simulations indicate that the slower dynamics at the hydrophobic interface compared to the water-air interface are due to the hydrogen bonds at the hydrophobic interface being stronger than those at the water-air interface.

¹The authors acknowledge support from the National Science Foundation (Grant No. CHE- 1151590).

Florian Figge
Department of Physics and Astronomy, Michigan State University

Date submitted: 06 Nov 2015

Electronic form version 1.4