Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

**Vibrational energy relaxation of water in Aerosol OT reverse micelle** YOONSOO PANG, ZHAOHUI WANG, University of Illinois, Urbana-Champaign, JOHN DEAK, University of Scranton, DANA DLOTT, University of Illinois, Urbana-Champaign — An IR-Raman technique with mid-IR pump and anti-Stokes Raman probe is used to investigate reverse micelle mixture of Aerosol OT, water, and carbon tetrachloride, where polar water phase and nonpolar oil phase is separated by a monolayer of surfactant molecules. Anti-Stokes Raman scattering is only dependent on the population of vibrationally excited states, thus time-dependent population changes of parent/daughter vibrations can be monitored with this technique. Vibrational energy from nanodroplet of water is transferred to the surfactant head group in 1.8 ps and then out to solvent in 10 ps. Vibrational energy directly pumped into the surfactant tail group results in a slower 20-40 ps energy transfer to solvent. This energy transfer cannot be explained by ordinary heat transfer, but the specific vibrational energy relaxation pathway such as sulfonate stretch of surfactant molecules should be used. We can change the water-to-solvent energy transfer rate by adopting different size of reverse micelles or changing pump frequency over the broad OH stretch mode of water due to hydrogen bond network. Water molecules confined in nanometer scale reverse micelles have very different properties from bulk water and we have found many differences between the vibrational dynamics of water in these reverse micelles and those of bulk water.

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Date submitted: 23 Nov 2004 Electronic form version 1.4