A new state of water

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When a high-voltage direct-current is applied to two beakers filled with water, a horizontal electrohydrodynamic (EHD) bridge forms between the two beakers. Recently the energy relaxation of the OH stretch vibration of HDO molecules contained in an HDO:D_2O water bridge using femtosecond mid-infrared pump–probe spectroscopy was measured. We found that the vibrational lifetime is shorter (~630±50 fs) than for HDO molecules in bulk HDO:D_2O (~740±40 fs). In contrast, the thermalization dynamics following the vibrational relaxation are much slower (~1.5±0.4 ps) than in bulk HDO:D_2O (~250±90 fs). These differences in energy relaxation dynamics strongly indicate that the water bridge and bulk water differ on a molecular scale.

In another recent study, the transport and behavior of bacterial cells added to an EHD bridge set-up was investigated. It is shown that *E. coli* top10 (Invitrogen, Carlsbad, CA, USA) and bioluminescent *E. coli* YMC10 with a plasmid (pJE202) containing *Vibrio fischeri* genes can survive the exposure to an EHD liquid bridge set-up. Most *E. coli* YMC10 bacteria which passed the EHD bridge exhibited increased luminescent activity after 24 h. This can be explained by two likely mechanisms: nutrient limitation in the heavier

inoculated vials and a ‘survival of the strongest’ mechanism.

Finally, in a third recent paper, it is demonstrated that the bridging phenomenon is not water intrinsic, but can be reproduced with any polar liquid of sufficiently low DC conductivity and sufficiently high permittivity.