

Abstract Submitted
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Experiments on Tracer Diffusion in Water and Aqueous Mixtures¹ DAN SPIEGEL, Trinity University — We have used forced Rayleigh scattering to measure tracer diffusion coefficients in water and other liquids. The tracer molecule is the azobenzene derivative methyl red (MR). In one set of experiments diffusion was measured at different temperatures to test the Cohen-Turnbull (CT) free volume diffusion theory. It was found that eight solvents were in reasonable agreement with CT, but the relevant energy in water was smaller by an order of magnitude. We believe this is due to the “zero-point” free volume that water would possess, due to its H-bonds, even at the glass transition temperature, and to the ability of MR to diffuse along its plane. In a second set of experiments we studied diffusion in aqueous and non-aqueous mixtures. The non-aqueous mixtures are in good agreement with free volume theory, but the aqueous mixtures show large disagreement. We suggest this is caused by the formation of two solvent shells in the aqueous mixtures, driven by the hydrophobicity of MR and water-amphiphile hydrogen bonding.

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