Relaxation Dynamics in Glass-Forming Hydrogen-Bonded Liquids

H.G.E. HENTSCHEL, Emory University, ITAMAR PROCACCIA, Weizmann Institute of Science — We will address the relaxation dynamics in hydrogen-bonded super-cooled liquids near (but above) the glass transition, measured via Broad-Band Dielectric Spectroscopy (BDS). We propose a theory based on decomposing the relaxation of the macroscopic dipole moment into contributions from hydrogen bonded clusters of molecules. We discuss the statistical mechanics of the super-cooled liquid and with a theoretical estimate of the relaxation time of each cluster we provide predictions for the real and imaginary part of the frequency dependent dielectric response. Using glycerol as a particular example we demonstrate quantitative correspondence between theory and experiments. The theory also demonstrates that the \( \alpha \) peak and the “excess wing” stem from the same physics in this material.