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Investigating the Diffusive Behavior of HPC with DLS and FPR
RYAN MCDONOUGH, KIRIL STRELETZKY, CSU, PAUL RUSSO, LSU — Hydroxypropylcellulose (HPC) polymer chains were dissolved in aqueous solution in order to explore their diffusive qualities. Two fundamentally different methods: FPR (Fluorescence Photo-bleaching and Recovery) and DLS (Dynamic Light Scattering) were employed to study the structure and dynamics of HPC chains. FPR requires polymer to be chemically tagged by fluorescent molecules. FPR captures diffusion by establishing a photo-bleached boundary, observing only tagged particles diffusing back into the bleached area, yielding a contrast decay function. DLS autocorrelates scattered light intensity from particles, calculating a decay function which yields information about the self diffusion of particles at chemical equilibrium. An Inverse Laplace Transform Algorithm (CONTIN) and stretch exponential line shape analysis (LSA) quantitatively decomposed spectral decays into diffusion processes or modes. The LSA and CONTIN analysis on the same FPR decay spectra resulted in roughly similar modal distribution and mode intensity results. The modal distributions for FPR and DLS spectra on the same sample have shown consistent dissimilarities which may indicate a comparative limitation and/or sensitivity to a particular range of diffusive speeds or processes. The tag and/or tagging process appear to alter samples in a way that is quantifiable and consistent. The nature of diffusive processes in HPC appears to be complex, but analysis reveals a reproducible picture.

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