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Structural and Dynamical Studies of Concentrated Micrometer-Sized Colloidal Suspensions FAN ZHANG, ANDREW ALLEN, LYLE LEVINE, National Institute of Standards and Technology, JAN ILAVSKY, GABRIELLE LONG, Argonne National Laboratory — It is a well-documented challenge to quantify the dynamic behaviors of concentrated, optically opaque micrometer-sized colloidal suspensions with laser scattering techniques due to the complications introduced by multiple scattering events. In order to overcome this limit, we have developed an ultra-small angle X-ray scattering (USAXS) based X-ray photon correlation spectroscopy (XPCS) technique to probe the equilibrium dynamics of such materials. With this technique as well as USAXS, we have tracked the structural and dynamical properties of concentrated monodisperse suspensions of different sized polystyrene (PS) microspheres in glycerol. For these PS suspensions, we found their static structures display a hard-sphere like behavior. Furthermore, by analyzing the intensity autocorrelation functions, we found the inverse of the effective diffusion coefficients display a peak with respect to the scattering vector that resembles the peaks in the static structure factors, a signature of de-Gennes narrowing. We also identified evidence supporting a collective motion of the microspheres.

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