Volume and Interface Studies of Complex Liquid Media

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**Introduction**

SINGLE-BEAM MULTIPLE SCATTERING SUPPRESSION BY CROSS-CORRELATION IN VOLUME LIGHT SCATTERING

In Section I our new method for characterizing particles in turbid media by cross-correlating the scattered intensity fluctuations at two nearby points (perpendicular to the scattering plane) in the far field is described. The cross-correlation function selectively emphasizes single scattering over multiple scattering. The usual dynamic light scattering capability of inferring particle size from decay rate is thus extended to samples which are so turbid as to be visually opaque. The method relies on single-scattering speckle being physically larger than multiple scattering speckle. With a suitable optical geometry to select nearby points in the far field or equivalently slightly different scattering wave vectors (of the same magnitude), the multiple scattering contribution to the cross-correlation function may be reduced and in some cases rendered insignificant. The viability of this technique has been confirmed at NASA and the University of Amsterdam (UvA), and recently combined with small angle X-ray scattering and dynamic X-ray scattering (Riese et al. [7] at UvA), allowing the measurement of hydrodynamic interactions.

ADVANCES IN SURFACE LIGHT SCATTERING SPECTROSCOPY

INSTRUMENTATION AND ANALYSIS FOR NON-INVASIVELY MEASURING SURFACE TENSION, VISCOSITY, AND OTHER INTERFACIAL PARAMETERS IN LIGHT SCATTERING SPECTROSCOPY

In Section II our new generation of vibration mitigating surface light scattering spectroscopy instrumentation is described. The computational application of an instrument function derived using Fourier optics is presented. We derived the necessary surface response function algorithms to study both simple fluids, and binary fluids at their wetting transition and near their critical points. This instrument and its accompanying suite of analysis software allow us to easily make accurate and non-invasive measurements of the interfacial tension, volume viscosity, and other interfacial parameters of fluids. These developments can be applied to study systems with liquid–vapor and liquid–liquid interfaces, including spreading monolayers whenever optical access for a laser beam is available. Theoretical and experimental results are provided for both simple fluids and asymmetric thin films.

*Count them photons he said with a wave. – X. Druid*