Monodisperse polystyrene suspensions investigated using wide-bandwidth ultrasonic measurements.

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Abstract.

Ultrasonic measurements offer a technique for monitoring concentrated suspensions and emulsions which are opaque to light, and the possibility of determining dispersed phase volume fraction, particle size and flocculation state. We have made a series of wide bandwidth (2 to 60 MHz) measurements of acoustic absorption and phase velocity in monodisperse polystyrene latices with particle sizes ranging from 200 to 600nm, and volume fractions from 5% to 45%. Experimental results have been compared with a number of theoretical models of acoustic propagation in colloids [1], and only scattering models based on that of Allegra & Hawley [2] have been found to give good agreement with our results. Single and multiple scattering approaches to evaluating the absorption and phase velocity from the Allegra & Hawley scattering coefficients have been compared.

Comparison of results for different particle sizes at fixed volume fraction with the scattering models has illustrated the possibility of using ultrasonic measurements to determine dispersed phase particle size and volume fraction, but some systematic differences between the $f\sqrt{f}$ dependence of velocity curves have been found. These may be due to the effect of interparticle forces, which is not included in the scattering models. Work is continuing on polystyrene particles coated with steric stabilising layers with differing polymer chain lengths in order to investigate this effect.

1. Holmes, A.K., Challis, R.E. and Wedlock, D.J., *J.Colloid Interface Sci.* **156** , 261-268 (1993).

2. Allegra, J.R. and Hawley, S.A., *J. Acoust. Soc. Am.* **51** , 1545-1564 (1972).