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Liquid Latex Particles

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Polymer latices normally consist of *solid* particles, for the simple reason that most polymers are indeed solid at ambient temperature. One of the exceptions is poly(dimethylsiloxane) [PDMS], which is a liquid, whose viscosity varies strongly with molecular weight. In this paper we describe the preparation and properties of *liquid* latex particles based on PDMS. These systems are essentially *surfactant-free, monodisperse* emulsions. The PDMS droplets are prepared by a nucleation and growth (i.e. dispersion type polymerisation) route, rather than by the more traditional comminution route, usually employed for emulsion systems. This leads to much better control of the droplet size and the size distribution.

The basic chemistry used is very similar to that employed in the preparation of colloidal silica particles, by the so-called *Stöber route*, namely the alkaline hydrolysis of an alkoxy alkyl silane. In this case *diethoxydimethyl*silane is used instead of *tetraethoxy*silane [1]. The droplets produced are monodisperse (typically ~ 1 to 5 μm, depending on the reaction time and the conditions) , and they are *charge-stabilised*. ^{1}H and ^{29}Si N.M.R. studies have indicated that, if the solvent used is just water, then the PDMS formed is essentially the D_4 cyclic oligomer, with maybe ~ 10 % short, linear chains (the -OEt or -OH end-groups of which are responsible for the surface charge). However, on adding ethanol to the reaction, the proportion of linear chains increases. Also, by incorporating some *triethoxymethyl*silane, partial cross-linking of the droplets may be achieved, with a corresponding increase in the viscosity of the droplets [2]
Being surfactant-free makes these emulsion systems eminently suitable for fundamental studies of the hydrodynamic properties of liquid droplets, and also droplet - droplet interactions (e.g. coalescence).

Some preliminary results will also be described, where we have investigated the formation of *core / shell* type structures, where the cores are liquid and the shells solid.

[1] T.M. Obey and B. Vincent, *J.Colloid Interface Sci.*, 1994 **163** 454.
[2] K.R. Anderson, T.M. Obey and B.Vincent, *Langmuir*, 1994 **10** 2493

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