

**Surface roughness effects in monodisperse polymer colloids**

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**Abstract**

This paper will describe experimental methods for the synthesis and characterisation of surface roughness in an idealised polystyrene latex, and subsequent combined experimental and computational studies of some of the effects of surface roughness on rheological properties.

Idealised latex particles for fundamental studies of the colloidal solid state, i.e. powders and suspensions of powders, are being produced using methods akin to Almog et al (1982); i.e. a dispersion polymerisation of styrene in alcohol in the presence of both electrostatic and polymer steric surface stabilisers.

Recent progress will be reported in the synthesis and characterisation of the surface roughness of the particles using electron microscopy. Particles that previously were regarded as being effectively smooth show a surface roughness which introduces additional parameters and hitherto neglected effects in interparticle forces and on rheological properties.

A degree of surface roughness is characterised experimentally using an argon adsorption technique first described by Bickley et al. (1991). This differential adsorption technique also measures inhomogeneities in surface roughness, on a particular distance scale, "holes and crevices" (as recently noted by Paine et al. in 1990), which arise from the uptake of the PVP steric stabiliser on the surface.

Samples (Fig.1) have now been synthesised with varying degrees of surface roughness whilst maintaining size monodispersity (to 2%). This is achieved by alteration of the molecular weight of the PVP steric stabiliser, and associated adjustments of the reaction conditions to regulate particle size. Samples differing only in the extent of surface roughness are thereby available for experiments on the effect of this aspect alone.

Results will be reported both on the rheometric experimental measurements of rheological effects, and for computer simulation studies on idealised hard-sphere models of monodisperse colloids, with and without surface friction.

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