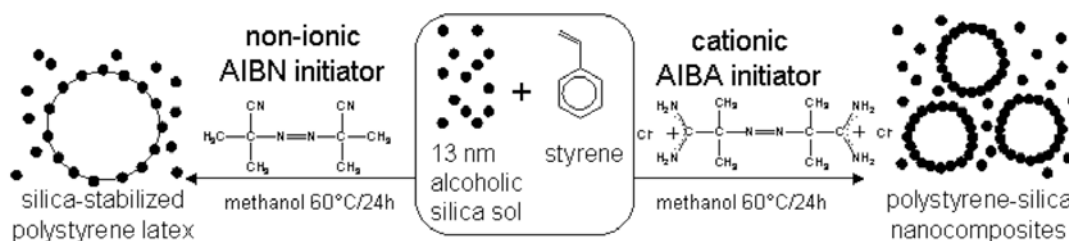


Colloidal Polystyrene-Silica Hybrid Particles Prepared via Alcoholic Dispersion Polymerisation

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Micrometer-sized silica-stabilised polystyrene latex particles¹ were obtained by the dispersion polymerisation of styrene in either methanol or 2-propanol in the presence of a commercial 13 nm or 22 nm alcoholic silica sol using AIBN initiator at 60°C. Thermogravimetric analysis confirmed that the silica content was no more than 1.1 % by mass. However, styrene polymerisations conducted under the same conditions in the absence of the silica sol always led to macroscopic precipitation, with no evidence for particle formation. Thus the presence of the silica sol is essential for the production of colloiddally stable latex particles. Close inspection by transmission electron microscopy confirmed that the silica sol is located at the latex surface and the sol distribution appears to be patchy (i.e. submonolayer coverage), rather than a continuous shell. This is consistent with the low silica contents of these particles. Increasing the silica sol concentration in the formulation from 2 to 8 w/v % leads to a systematic reduction in the latex size, as judged by disc centrifuge photosedimentometry. Replacing the AIBN initiator with a *cationic* AIBA initiator, under otherwise identical conditions, leads to the formation of submicrometer-sized polystyrene-silica nanocomposite particles.² These polystyrene-silica nanocomposite particles have relatively narrow particle size distributions, with mean diameters ranging from 331 nm to 464 nm as judged by disc centrifuge photosedimentometry. Neither surface modification of the silica sol nor the addition of surfactant or polymeric stabilizers is required for successful nanocomposite syntheses. Thermogravimetric analyses indicated mean silica contents of 13 to 26 wt. %, depending on the synthesis conditions. Calcination of the purified polystyrene-silica nanocomposite particles leads to the formation of hollow silica capsules, which indicates a well-defined core-shell morphology for the original nanocomposite particles.



- 1 A. Schmid, S. Fujii and S. P. Armes *Langmuir* **2005**, *21*, 8103;
- 2 A. Schmid, S. Fujii and S. P. Armes *Langmuir* **2006**, *22*, 4923.