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Link to published version (if available):
10.1016/j.jcis.2016.06.027

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S1. Materials

The source of the materials used in the synthesis of latexes is given below.

- Methyl methacrylate (99%, inhibitor removed, Aldrich)
- Methacrylic acid (99%, Aldrich)
- PMMA-graft-PHSA (Batch R8893/252)
- Azobisisobutyronitrile (98%, Acros Organics)
- 1-Octanethiol (98.5%, Aldrich)
- Diethanolamine (> 99%, Aldrich)
- n-Hexane (minimum 95%, VWR)
- n-Dodecane (≥ 99%, Sigma–Aldrich)
- n-Dodecane-d_{26} (98%, Cambridge Isotope Laboratories)
S2. SAXS of dilute dispersion of 76 nm latexes

SAXS measurements were made on a dilute dispersion (φ = 0.02) of 76 nm latexes in \textit{n}-dodecane. The measured data and fit to a spherical form factor are shown in Figure S1. The best fit radius is 28.4 nm, and the data is fit with a log-normal size distribution with σ = 0.09.

Figure S1: SAXS of a dilute dispersion (φ = 0.02) of 76 nm latexes in \textit{n}-dodecane. The data has been fit to a spherical form factor; the best fit radius is 28.4 nm.
S3. Residual scattering in contrast-matched $n$-dodecane

SANS measurements were performed on dispersions of 76 nm latexes in latex contrast-matched $n$-dodecane at two different volume fractions ($\phi = 0.02$ and 0.19), as shown in Figure S2. There is no contribution from the latexes in the dilute dispersion, but there is residual scattering from the latexes in the concentrated dispersion.

Figure S2: Residual SANS for 76 nm latexes in latex contrast-matched $n$-dodecane at two volume fractions ($\phi = 0.02$ and 0.19).
S4. SEM of 685 nm latexes

An example SEM image of the 685 nm latexes used to determine the distribution of the core size is shown in Figure S3.

Figure S3: SEM image of 685 nm latexes.
S5. Analytical centrifugation

Raw data measured for dispersions of 685 nm latexes in n-dodecane and n-dodecane$^{d_{26}}$ on the LUMiSizer are shown in Figure S4. The $y$-axis shows the percentage of light transmitted through the cells, and the $x$-axis shows the position along the cell. The curves are measured as a function of time while the particles sediment, with red curves showing the first measurements and green curves showing the last measurements.

Figure S4: Particle sedimentation measured using the LUMiSizer in n-dodecane and n-dodecane$^{d_{26}}$. The sedimentation velocity is greater in the unlabeled n-dodecane due to its lower density and viscosity compared to n-dodecane$^{d_{26}}$. 