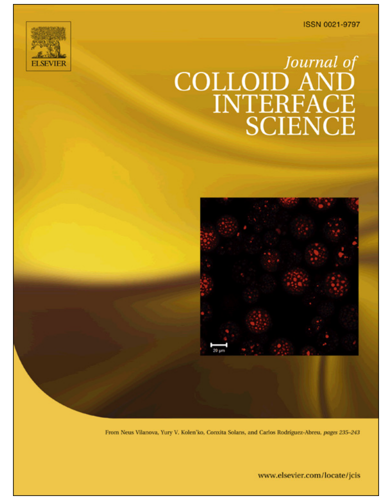
Accepted Manuscript



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PII: S0021-9797(16)30386-1
DOI: http://dx.doi.org/10.1016/j.jcis.2016.06.027
Reference: YJCIS 21337

To appear in: *Journal of Colloid and Interface Science*

Received Date: 4 May 2016
Revised Date: 8 June 2016
Accepted Date: 8 June 2016

Please cite this article as: G.N. Smith, S.D. Finlayson, D.A.J. Gillespie, J. Peach, J.C. Pegg, S.E. Rogers, O. Shebanova, A.E. Terry, S.P. Armes, P. Bartlett, J. Eastoe, The internal structure of poly(methyl methacrylate) latexes in nonpolar solvents, *Journal of Colloid and Interface Science* (2016), doi: http://dx.doi.org/10.1016/j.jcis.2016.06.027

The internal structure of poly(methyl methacrylate) latexes in nonpolar solvents

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Abstract

Hypothesis. Poly(methyl methacrylate) (PMMA) latexes in nonpolar solvents are an excellent model system to understand phenomena in low dielectric media, and understanding their internal structure is critical to characterizing their performance in both fundamental studies of colloidal interactions and in potential industrial applications. Both the PMMA cores and the poly(12-hydroxystearic acid) (PHSA) shells of the latexes are known to be penetrable by solvent and small molecules, but the relevance of this for the properties of these particles is unknown.

Experiments. These particles can be prepared in a broad range of sizes, and two PMMA latexes dispersed in *n*-dodecane (76 and 685 nm in diameter) were studied using techniques appropriate to their size. Small-angle scattering (using both neutrons and X-rays) was used to study the small latexes, and analytical centrifugation was used to study the large latexes. These studies enabled the calculation of the core densities and the amount of solvent in the stabilizer shells for both latexes. Both have consequences on interpreting measurements using these latexes.

Findings. The PHSA shells are highly solvated ($\sim$ 85 % solvent by volume), as expected for effective steric stabilizers. However, the PHSA chains do contribute to the intensity of neutron scattering measurements on concentrated dispersions and cannot be ignored. The PMMA cores have a slightly lower density than PMMA homopolymer, which shows that only a small free volume is required to allow small molecules to penetrate into the cores. Interestingly, the observations are essentially the same, regardless of the size of the particle; these are general features of these polymer latexes. Despite the latexes being used as a model physical system, the internal chemical structure is complex and must be fully considered when characterizing them.

Keywords: Nonpolar solvents; Latexes; Small-angle scattering; Analytical centrifugation