PC 25

PACKING EFFICIENCY OF SMALL SILICA PARTICLES ON LARGE LATEX PARTICLES

J.A. Balmer, S.P. Armes, P.W. Fowler

Department of Chemistry, Dainton Building, The University of Sheffield, Brook Hill, Sheffield, S3 7HF, UK

There are various literature examples of colloidal nanocomposites with core-shell morphologies in which small spheres comprising the shell are assembled upon a larger spherical core.[1] In related work, Ottewill *et al*.[2] calculated the number of latex spheres required to form a well-defined shell around a latex core by assuming that (i) the latex spheres within the shell layer were hexagonally close-packed and (ii) the core diameter was significantly larger than the shell thickness (hence, to a first approximation, the latex core could be assumed to be a planar surface).

Here we consider the packing of 20 nm silica spheres onto a spherical polymer latex of variable diameter. We assume that the silica spheres pack with icosahedral symmetry around the latex, introduce a *packing factor P* and hence develop an equation to calculate the number of silica particles required for monolayer coverage. Moreover, we suggest that a good experimental test for monolayer coverage is the formation of hollow silica capsules after calcination of the original polymer-silica nanocomposite particles. The silica content of the calcined nanocomposite can be determined by thermogravimetric analysis, and thus the experimental packing fraction *P* can be calculated and compared with that determined theoretically. In principle, this approach may allow different nanocomposite morphologies (e.g. core-shell vs. raspberry) to be differentiated.

1. Schmid, A., Fujii, S., Armes, S.P., *et al*., *Chem. Mater*., **2007**, *19*, 2435
2. Ottewill, R.H., Schofield, A.B., Waters, J.A., Williams, N.S.J., *Colloid Polym. Sci.* **1997**, *275*, 274.