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Easy fabrication of poly(butyl acrylate)/silicon dioxide core-shell composite microspheres through ultrasonically initiated encapsulation emulsion polymerization

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ABSTRACT

In this study, instead of using the usual chemical methods, poly(butyl acrylate)/silicon dioxide (PBA/SiO₂) core-shell composite microspheres were prepared using a physical method-ultrasonically initiated encapsulation emulsion polymerization. The morphology and particle size of the PBA/SiO₂ microspheres were analysed using transmission electron microscopy (TEM) and dynamic light scattering (DLS). The encapsulation state was determined using X-ray photoelectron spectroscopy (XPS). The composition and thermogravimetric behavior were characterized using Fourier transform infrared spectroscopy (FTIR) and thermogravimetric analysis (TGA). The TEM and DLS results show that monodisperse PBA/SiO₂ core-shell composite microspheres were successfully obtained. The diameter and shell thickness were 150 nm and 15 nm, respectively. The XPS and FTIR results show that there was no new chemical bond between the PBA shell and the SiO₂ core. They were just combined by physical adsorption. The encapsulation efficiency of SiO₂ microspheres by PBA is 8.2% through TGA. In addition, this article focuses on the formation mechanism of PBA/SiO₂ core-shell microspheres prepared through ultrasonically initiated encapsulation emulsion

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