A Highly Anisotropic and Hydrolytically Degradable Pickering Emulsifier for Oil-in-Water Emulsions

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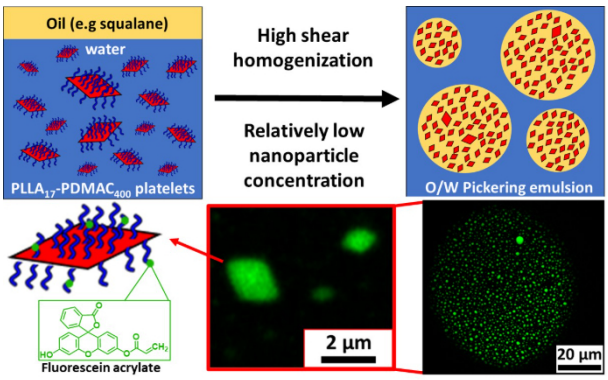
Highly anisotropic poly(L-lactide)-based block copolymer nanoparticles are prepared by the judicious combination of reverse sequence polymerization-induced self-assembly (PISA) with crystallization-driven self-assembly (CDSA). Such nanoparticles can be efficiently prepared as a 30% w/w aqueous dispersion and possess a distinctive diamond platelet morphology as judged by transmission electron microscopy. X-ray diffraction studies confirm the semicrystalline nature of the poly(L-lactide) block while atomic force microscopy analysis suggests a mean thickness of approximately 6 nm for the dried platelets. Small-angle X-ray scattering studies suggest that these platelets form localized tactoids at copolymer concentrations as low as 1.0% w/w. Herein we evaluate these platelets as a hydrolytically degradable Pickering emulsifier for the preparation of oil-in-water emulsions using various oils. In the case of squalane, systematic variation of the copolymer concentration and the high-shear homogenization conditions enabled the mean oil droplet diameter to be varied from approximately 40 μm to 125 μm. Fluorescein-labeled platelets were imaged on the surface of oil droplets using confocal microscopy. Such studies indicate submonolayer coverage even under optimized conditions, which may account for the unexpected long-term instability observed for such Pickering emulsions.

Keywords:
Pickering Emulsion, Crystallization-Induced Self-Assembly, Reverse Sequence Polymerization-Induced Self-Assembly.



Preparation of Oil-in-Water Pickering Emulsions Using Hydrolytically Degradable Diblock Copolymer Platelets

References:

[1] Tyler, J. J. S.; Farmer, M. A. H.; Mykhaylyk, O. O.; Orchard, M. J.; Musa, O. M.; Armes, S. P. A Highly Anisotropic and Hydrolytically Degradable Pickering Emulsifier for Oil-in-Water Emulsions. *Langmuir* **2025** .

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