

"Smart Emulsions": Switchable Emulsions using Light

Overview

Emulsion polymerization is of enormous industrial importance for synthesis of polymer latexes for a wide range of applications. Commercial latexes contain large amounts of water, typically ~50% by weight. High costs are associated with transporting the latex from the production site to the customer. It follows that transport costs could be significantly reduced by removing the water and transporting only the dry latex, followed by addition of the water (as required) and restoration of the emulsion (e.g. waterborne coatings) at the application site. The present technology may provide a cost-effective and environmentally friendly way of achieving this based on surfactant-based nano-engineering of the constituting polymeric nanoparticles by use of light-responsive surfactants.

The Technology

Typically, large amounts of surfactants are employed to stabilize polymer latexes during polymerization and subsequent latex storage. By use of specific surfactants that can be activated/deactivated by exposure to light of specific wavelengths, in the absence of any extra additives, it would be possible to destabilize/restore the latex at will. As such, one could conveniently destabilize the latex at the production site, remove the water, and transport the dry polymeric nanoparticles. At the application site, one could add water and restore the latex by surfactant activation employing light of the appropriate wavelength.

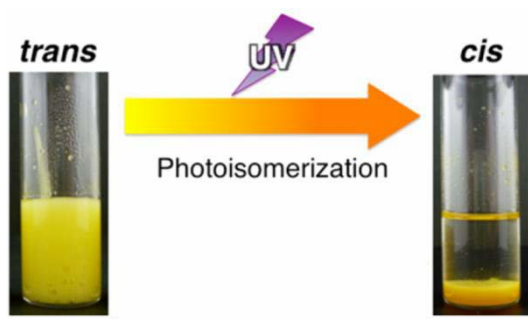


Fig. 1. Destabilization of latex by switching surfactant between active (*trans*) and inactive (*cis*) state (Y. Takahashi, N. Koizumi, Y. Kondo, *Langmuir* **2016**, 32, 683).

Our Expertise

At the Centre for Advanced Macromolecular Design (CAMD) at UNSW, we have extensive expertise in radical polymerization in aqueous dispersed systems for latex synthesis (Prof Per Zetterlund). We are collaborating with researchers at Tokyo University of Science (Prof Yukishige Kondo), who are experts in the area of surface/colloid chemistry, to develop the present technology.