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Novel Light-Responsive Surfactants for Formation of Singe Component Photo-Rheological Fluids

Research into the development and understanding of photo-rheological fluid formulations has gained significant momentum in recent years due to their potential for widespread application in fields such as biomedicine, nanotechnology and oil drilling. Imparting of photo-controlled viscosity to a solution can be achieved by formation and destruction of elongated worm-like micelle surfactant aggregates. While many successful photo-rheological fluid formulations have been developed using this method the overwhelming majority are quite complex, using multiple components each required in specific concentrations.

We are currently developing and synthesising a library of novel Azo-Betaine surfactants, with the primary goal of using them to create simple single component photo-rheological fluid formulations. Additionally, using this library, we hope to better understand the relationship between a surfactants chemical structure and its physical properties, both in the bulk solution and at the interface. These simplified systems will allow more widespread application of photo-rheological fluids, while the surfactant library will further our understanding of their structure-property relationship.

Currently we have a completed synthesis and testing of a small five molecule library of photo-surfactants, using small-angle neutron scattering to determine their aggregation structure in aqueous solution. Results from these initial surfactants show elongated rod-like micelles that revert to almost entirely spherical micelles on irradiation with UV light. This change in aggregation geometry exceeds any previously observed within our group when using single component photo-surfactant formulations. Additionally, we are beginning to understand the relationship between tail group length, bulk and the resulting surfactant aggregation properties for this novel class of surfactants.

Topic

Chemistry

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