

Poly(DEAEMA-co-PEGMA): a New pH-Responsive Comb Copolymer Surfactant for Dispersions and Emulsions

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Stimulus responsive copolymers are an important class of surfactants that are attracting growing attention in the literature. When used to stabilise colloids they confer responsiveness to an otherwise non-responsive system. This provides added versatility to the dispersions and enables new possibilities for application. This includes release of active molecules within coatings. We designed a copolymer surfactant that would show a major conformational change within the pH range which is applicable to surface coatings. The pH of a paint dispersion is usually about 8, whereas that of the corresponding film is about 5. In this work a pH-responsive comb copolymer surfactant is introduced that has a pK_a of about 6.5. The copolymer is poly(DEAEMA-co-PEGMA), where DEAEMA and PEGMA are diethylaminoethyl methacrylate and poly(ethylene glycol) methacrylate. The copolymer enables preparation of fine particulate dispersions and emulsions. The dispersions used are based on carbendazim which is a common fungicide used in paints. The oil-in-water emulsions discussed contain tetradecane. The dispersions and emulsions remain as fluids at pH values greater than the pK_a with evidence of flocculation. Interestingly, the emulsions completely phase separate when the pH is decreased to low values, releasing the oil phase. The mechanism for the pH-triggered behaviour and the implications for polymer colloid applications of this new responsive copolymer surfactant are discussed.