

# Interfacial properties of colloidal microgels

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## **Abstract**

The aim of this study was to investigate the potential use of microgel particles for lowering surface tension compared to conventional methods i.e. surfactants. Poly(NIPAM) microgels are hydrophilic and a range of hydrophobic co-monomers (vinyl laurate ( $\text{CH}_3(\text{CH}_2)_9\text{CH}_2\text{COCH}=\text{CH}_2$ ), dodecyl vinyl ether ( $\text{CH}_3(\text{CH}_2)_{11}\text{OCH}=\text{CH}_2$ ) and vinyl 4-tert-butylbenzoate ( $\text{CH}_3)_3\text{CC}_6\text{H}_4\text{CO}_2\text{CH}=\text{CH}_2$ )) were incorporated during synthesis to determine their effect on interfacial properties. A new microgel poly(vinyl caprolactam-co-methyl methacrylate) was also investigated. The microgels were prepared by surfactant-free emulsion polymerisation and all show shrinking and swelling behaviour as a function of temperature. The properties of the microgel particles were compared to a widely-used surfactant, sodium dodecyl sulphate (SDS). Surface tension was measured as a function of concentration, and above and below the volume phase transition temperature of the microgel particles. Results showed that the microgel particles exhibit a lower surface tension when collapsed compared to the swollen state, with the exception of poly(NIPAM)-co-vinyl-4-tert-butylbenzoate which had a similar surface tension at both temperatures. When compared to SDS the microgels display different behaviour (i.e. do not exhibit a critical micelle concentration) but they still achieve a substantial reduction in interfacial tension at much lower concentrations than that of the surfactant SDS.