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Influence of D-glucose as additive on thermodynamics and physical properties of aqueous surfactant two-phase systems for the continuous micellar extraction

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### Highlights

D-glucose influences the physical properties of micellar two-phase systems.

Sugar decreases the cloud point temperature of micellar solutions.

D-glucose enables continuous extraction using Tergitol 15-S-7.

Tergitol 15-S-7 was applied in a continuous extraction processes.

COSMOmic predicts the influence of sugar on solute partitioning in micelles.

### Abstract

Aqueous nonionic surfactants solutions can form two coexisting phases when heated beyond the so called cloud point temperature. Hence, these surfactants are potential solvents for extraction processes. In this work the effect of D-glucose on phase behavior of aqueous surfactant two-phase systems containing the nonionic surfactants Tergitol 15-S-7 or Triton X-114 was investigated in order to design micellar systems for liquid-liquid extraction. It was found that D-glucose can lead to an increased density difference if the surfactant-rich phase is the lighter one as well as an enhancement of the phase separation. Furthermore, the effect of D-glucose on the liquid-liquid equilibrium of aqueous Tergitol 15-S-7 solutions was studied. The partition behavior of three model solutes was determined and modeled with the combination of molecular dynamics simulations and the thermodynamic model COSMOmic. Based on these data an experiment in a continuous extraction column using an aqueous surfactant two-phase system containing D-glucose as additive was performed. The results demonstrate that sugars as additives can be used to tailor surfactant solutions in a beneficial way for separation processes.

**Keywords:** aqueous surfactant two-phase system, cloud point, Tergitol 15-S-7, Triton X-114, COSMOmic, molecular dynamics simulation

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