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# The Rheological and Colloidal Properties of Bentonite Dispersions in the Presence of Organic Compounds V. Bentonite and Sodium Montmorillonite and Surfactants

Thorsten Permien and Gerhard Lagaly

Institute of Inorganic Chemistry, Kiel University, Olshausenstraße 40, D-24098 Kiel, Germany

**Abstract:** The influence of surfactants on the flow behavior of sodium montmorillonite dispersions (2% w/w) was studied for a cationic (cetylpyridinium chloride, CPCI) and an anionic surfactant (sodium dodecylsulfate, SDS). When the dispersion pHs were  $>3.5$  and  $<7$ , CPCI concentrations  $>10^{-4}$  M increased the shear stress but the Bingham yield value remained virtually unchanged ( $\tau_o \approx 100$  mPa). At  $\text{pH} \approx 7$ , the shear stress and yield point decreased with increasing CPCI concentration ( $\tau_o$  from 430 to 100 mPa). The flow properties of sodium calcium bentonite dispersions were independent of pH and CPCI concentrations  $\leq 10^{-4}$  M; they increased modestly at higher concentrations. At  $\text{pH} < 4$ , SDS addition to the sodium montmorillonite dispersions increased the shear stress and yield value to a maximum value ( $\tau_o = 2100$  mPa) at  $10^{-3}$  M SDS; higher SDS concentrations reduced the shear stress and yield value. At  $\text{pH} > 4$ , the flow values decreased to a minimum value at  $10^{-2}$  M SDS ( $\tau_o$  from 430 to 50 mPa). The flow of the sodium calcium bentonite dispersions at  $\text{pH} > 4$  was independent of SDS concentrations  $\leq 10^{-3}$  mole/liter; at higher SDS concentrations, the flow values increased more strongly in sodium calcium bentonite than in sodium montmorillonite dispersions.

Surfactants influence the flow behavior of sodium montmorillonite dispersions by their action on the card-house networks in strongly acidic medium and, at higher pH, by the electroviscous effect. At the highest surfactant concentrations without flocculation, the shear stress and yield value are increased by interacting chains of opposed particles.

Addition of the surfactants increases the salt (NaCl) stability of the dispersions because the adsorbed surface active agents influence the counterion distribution between the Stern and the diffuse ionic layer.

**Key Words:** Bentonite • Cetylpyridinium chloride • Coagulation • Flow behavior • Montmorillonite • Sodium dodecylsulfate (SDS) • Surfactants

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