

High viscosities of cationic and anionic micellar solutions in the presence of added salts

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Viscosities of micelles of cetyltrimethylammonium salts (CTAX, X = tosylate (TOS⁻), Cl⁻, Br⁻, NO₃⁻) in the presence of Cl⁻, Br⁻, NO₃⁻, benzene sulfonate (BS⁻), and TOS⁻, of cetylpyridinium chloride (CpyC) in the presence of Cl⁻, Br⁻, and NO₃⁻, and of sodium dodecyl sulfate (SDS) in the presence of Na⁺ and H⁺ counterions have been measured at 25 ± 0.01 °C. Viscosities were determined using a conventional Ubbelöhde viscometer connected to a wide U-Shaped tube containing water, which allowed measurement of the viscosities under different pressure and, consequently, at different flow rates; the viscosities reported here correspond to the values extrapolated to zero rate of flow because the solutions were highly non-Newtonian. The viscosity values exhibit the order TOS⁻ > NO₃⁻ > Br⁻ > Cl⁻ in CTAX and Na⁺ > H⁺ in SDS micellar solutions; i.e., the more strongly bound counterions produce the more viscous solution. The high viscosities observed in these systems are interpreted in terms of a