

Critical Micelle Concentration

This application note presents results obtained using an Automatic Continuous Mixing (ACM) technique which includes a DAWN EOS, RI and conductimetric detectors. Several sodium dodecylsulfate (SDS) NaCl aqueous solutions were measured to demonstrate the feasibility of very fast determination of absolute critical micellar concentration (cmc), ionization degree α , aggregation number N and second virial coefficient B .

A home-made mixing chamber of 10 mL equipped with a magnetic stirrer and conductivity cell was used to concentrate or to dilute the samples. A peristaltic pump transferred either a surfactant stock solution (concentration gradient) or a reservoir of solvent (baseline and dilution gradient) into the mixing chamber. A second pump pushed the mixed solution through an inline 0.45mm frit filter into the detector train at the same flow rate (2 mL/min).

Figure 1 shows the raw voltage collected during monitoring by the three detectors for a typical cycle of concentration-dilution gradient experiment of aqueous SDS solution. Figure 1b shows the simultaneous determination of the CMC by conductimetric detector and the DAWN for SDS in pure water. The light scattering intensity from the micellar solution can be computed by the classical Debye equation. The micelle aggregation number N is calculated by $N = M/M_0$ where M_0 is the molecular weight of the surfactant.

Automated data acquisition for batch characterization of colloid solution has been demonstrated by using the same detectors. The method has yielded reproducible values of CMC, α , B and N , and it has several advantages over traditional manual methods in terms of accuracy, sample preparation, labor saving, and the potential for automation of colloid solution characterization.

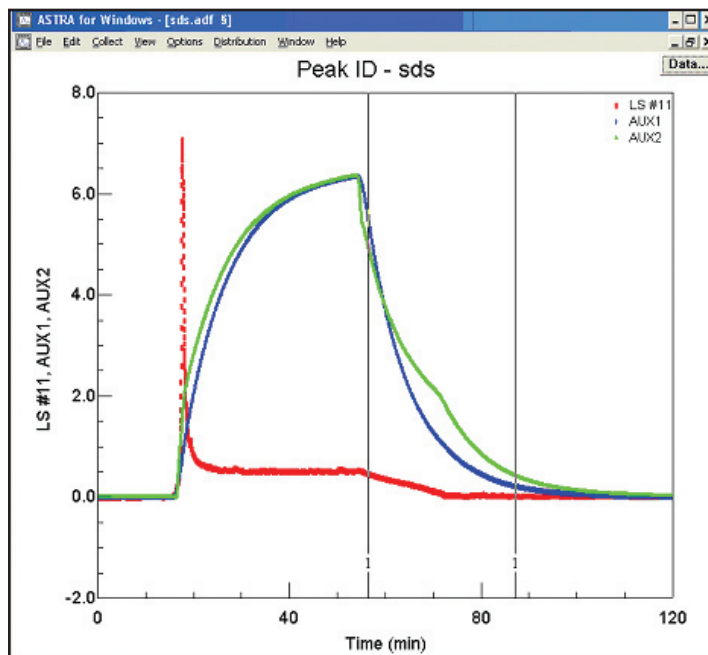


Figure 1 : Raw voltage collected during a typical monitoring using three detectors : from bottom to top, refractometer (RI), conductimeter and LS at 90°.

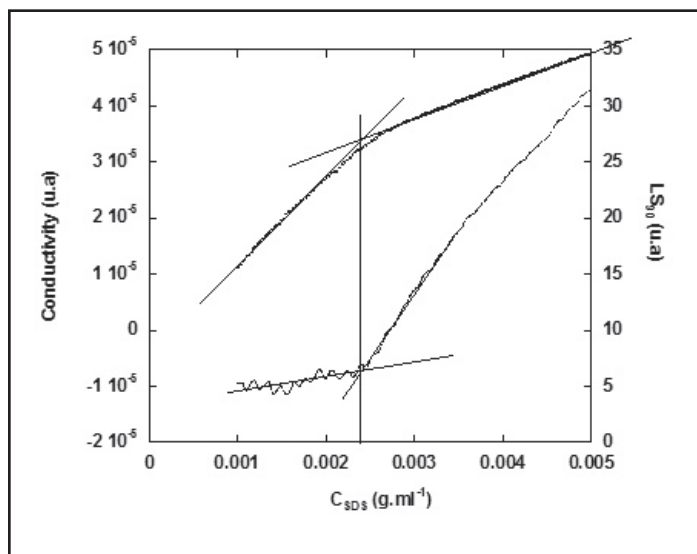
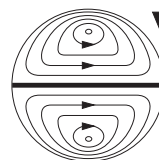


Figure 2. Simultaneous determination of the CMC by conductimetry and LS of SDS in pure water (in Fig. 1).

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