The thesis has been constituted by two sets of experiments (clouding phenomenon and micellar morphology) on quaternary anionic surfactants with and without additives. Micellization process of quaternary surfactants gets facilitated initially with heating followed by usual temperature effect reported for conventional anionic surfactants. Conductivity variation with temperature shows [TBADS] dependence. It has been noted that CP decreases as the surfactant concentration increases. CP can be tuned with [surfactant], nature of salt and [salt]. The clouding phenomenon in present anionic surfactants is a spontaneous process both in presence or absence of inorganic salts. The increase in micellar interactions derives the removal of a more hydrophobic entity from water resulting in the clouding and the phase separation. Both ΔH°_{c} and ΔS°_{c} are positive and negative depending upon the added [salt] contributing to the net interaction between micelles. The clouding behaviour of these surfactants, in binary aqueous solution (surfactant + water), is an endothermic process. However, presence of salt makes the process endo- or exothermic depending upon the [salt] as well as the charge on the salt counter ion. It is also observed that at lower [salt], the micellar structures are more ordered (-ve ΔS°_{c}) whereas the entropy cost of ordering water around the bulk counterion becomes untenable on increasing [salt] tending towards the disordered (+ve ΔS°_{c}) system.

Clouding phenomenon occurs gradually in quaternary surfactants when compared to that in nonionic surfactant solutions. For clouding, only a small fraction of individual micelles is needed that convert into giant aggregates. Morphological changes, when the system approaches the CP, have been observed. NMR, SANS and DLS data depict that two morphologies are present when above quaternary surfactant solutions are heated towards CP. The study shows unusual micellar growth on heating with the above surfactants. The onset of attractive interactions among the grown micelles is also confirmed from the NMR studies at variable temperature. 2D NMR data allow to conclude that quaternary counterion penetrates the micellar interior which is responsible for charge neutralization (of the micellar surface) as well as for increased attractive interactions. POM data show that bigger morphologies are formed at the cost of smaller ones when the system is heated to CP.

Effect of addition of drugs to the surfactant solution also show CP decrease as was observed in case of surfactant concentration effect. This shows these drugs are also solubilised in the micellar interior (in fact 2D NMR and POM data confirmed this proposition) and responsible for micellar growth. Few preconcentration studies with curcumin show that the solubility of curcumin can be increased many fold in surfactant rich phase. Hence a potential of the quaternary surfactants as carriers can be envisioned because of the responses at physiological temperature. Also, metal ion can be concentrated in this phase as was shown by atomic absorption spectroscopy. This means hazardous metal ions (e.g., Hg^{+2} in present study) can be concentrated even at RT by optimizing the concentration of a typical quaternary anionic surfactant (to observe CP below / at RT). This methodology (CPE) can be improved by using quaternary anionic surfactants as they form pseudo non-ionic micelle (at / near CP). The metal ion can be bound and pre-concentrated in the rich phase at RT. In this way two steps (heating and addition of chelating agent) of convention CPE technique (using nonionic surfactants) can be reduced which is also desirable from the green chemistry point of view.