CHAPTER 2

Objectives and Scope
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The primary objective of the present investigation is to address some of the current issues in the area of electrochemistry of micelles and microemulsions. Both micelles and microemulsions were chosen for characterisation and electrochemical studies in the present work. Electroanalytical tools as well as other spectroscopic and surface analytical techniques were employed for studying different electrode processes chosen for the present investigation. The experimental approaches employed in the present investigation are briefly outlined in the next chapter (Chapter 3).

Micelles and microemulsions find extensive application in the various fields of electrochemistry. The objective of the present work is to focus on specific applications of micelles and microemulsions in the field of electroanalysis, electrochemical detoxification, electrosynthesis and electrodeposition of high surface area materials.

Essentially six broader issues related to micelles and microemulsions are addressed in the present work. These are briefly indicated here.

1) How the voltammetric responses in micelles and microemulsions compare with those of the conventional aqueous and aprotic media? How does the medium influence the peak potential and peak current values of reduction and oxidation processes? Which is the best medium from the stand point of electroanalysis? Does the medium influence the electron transfer kinetics as well? These issues are addressed in Chapter 4.

2) Can the surfactant concentration and nature of surfactant influence the electron transfer process? What happens when the surfactant concentration is below CMC, at CMC or above CMC? How does the reactant concentration itself influence the adsorption and electron transfer process? What are the insights that can be obtained from Voltammetric and Electrochemical impedance techniques (Chapter 5).
3) Can micelles assist electrochemical detoxification of phenols? Can they prevent electrode fouling? How does the electrode influence the detoxification process? Can electrogeneration of oxidising agents like chlorine and bromine influence electrochemical detoxification? Some of these issues are addressed in chapter 6.

4) Can we change the constituents of well characterised bicontinuous microemulsion? What is the role of oil phase, surfactant and cosurfactant in determining the physicochemical properties of bicontinuous microemulsion which are of interest in electron transfer processes? How does aliphatic chain length and aromaticity of oil phase influence viscosity and conductivity? Some of these issues are analysed in chapter 7.

5) Can electrochemical coupling reactions be possible in microemulsions under galvanostatic conditions? How successful are homolytic and heterolytic processes? What type of unsaturated molecules undergo successful homolytic coupling during electroreduction in microemulsion? What are the limitations of electrosynthesis in microemulsions? These issues are addressed in Chapter 8.

6) Does surfactant templates necessary for the electrodeposition of nanoporous surfaces? Can electrodeposition occur in simple water-in-oil microemulsions? How does the composition of microemulsion influence the electrodeposit? How can we measure the active surface area of such porous deposit? These aspects are addressed in chapter 9.

A brief outline of major conclusions of the present investigation are summarised in chapter 10. Scopes for further investigations are also indicted in this chapter.