Summary and Conclusion

The present dissertation comprises thorough investigations on dye-polymer system and polymer-surfactant system using different methods like dye-probing techniques, turbidity measurements, viscosity measurements and dynamic light scattering measurements, etc.

In Chapter 1, studies on the interaction of the dye and surfactant with Klebsiella K28 employing dye-probing technique have been elaborated. A blue shift in the absorption band of the dye pinacyanol bromide occurred upon progressive addition of SPS to the dye in aqueous medium. Formation of 1:1 stoichiometric complex between the dye and SPS K28 have been established. Evaluation of the thermodynamic parameter revealed that the binding process was exothermic in nature. Higher values of free energy change indicated that the dye-polymer aggregation is controlled both by electrostatic and hydrophobic interactions. The values of enthalpy and entropy changes revealed the interaction to be within the range of reversible biological process. It has also been established that the polymer-surfactant interaction gets initiated by electrostatic interaction and then gets stabilized by the hydrophobic interactions of the bound surfactant tails. The extent of freeing of dye molecules by a surfactant molecule from polymer-dye aggregate depends on the head group charge and chain length of the surfactant molecule.

In Chapter 2, results have been presented and discussed involving the dye-polymer interaction using Klebsiella K20 and K51. Herein also spectral shifts into the lower wavelength region were noticed upon the addition of SPS to the pseudoisocyanine dye pinacyanol chloride. The binding process has been found to be exothermic in nature. The studies revealed that the SPS could donate their electrons to the cationic dyes through the formation of charge transfer complexes. Thermodynamic parameters for the dye-polymer
interactions were found to be comparable with reversible biological processes. Fluorescence of cationic dye acridine orange got quenched upon addition of SPSs in aqueous medium. Also the quenching processes were of Stern-Volmer type.

In Chapter 3, the detailed studies on the dye-polymer and polymer-surfactant interaction have been reported which involved *Klebsiella* K43 SPS. SPS K43 and the dye molecule formed 1:1 stoichiometric complex. Thermodynamic studies revealed the interaction to be exothermic, spontaneous and ordered. The polymer-surfactant interaction has been studied using pure as well as mixed surfactants. The results indicated higher binding affinity in case of cationic-nonionic mixed surfactants due to decrease in the CMC values. The experimental results strongly revealed that the two forces, *viz.*, electrostatic and hydrophobic forces are essentially involved during the aggregation process of dye-polymer and polymer-surfactant.

The last chapter (Chapter 4) dealt with the polymer-surfactant interaction study by using turbidity measurement, viscosity measurement and dynamic light scattering methods. The cationic-nonionic mixed surfactants revealed higher binding capacity than the cationic surfactants due to their higher CMC values, which could overcome the precipitation problem occurring in turbidity measurements. Viscosity measurements exhibited the coiling up of the polymer due to polymer-surfactant interaction and finally the formation of macroscopic aggregates. Size enhancement has also been confirmed by these experiments. The interaction has been finally confirmed by the reversal of charge. Presence of both electrostatic and hydrophobic interaction has been established from these experiments.

Further studies like surface tension measurements and calorimetric studies could be done for these SPS.
Finally, considering all the physic-chemical properties of the four SPS as well as their aggregates with different dye and surfactant systems it could be concluded that the polysaccharides exhibited behavior different from the conventional polyelectrolytes. The aforementioned systems could be useful in terms of their medicinal aspects, specially the vaccines. These are considered to be the future perspective.