Chapter – 6

Conclusions:-

The first part of this thesis work has been devoted to spectroscopic characterization of photoexcited Curcumin in toluene-polar solvent mixtures investigated with steady state and picoseconds time resolved fluorescence spectroscopy.

The results obtained shows that ESHT reactions of Curcumin excited state depend critically upon the H-bonding property of the polar solvent. Consequently the solvation times of the pigment in toluene-methanol become slower (20-40 times) with respect to that in neat methanol. Dipolar solvation and IHB reorganization are coupled and therefore also depends critically on the H-bonding property of the polar solvent. Polar solvents having either HBD or both HBA and HBD were able to cause the spectral relaxation of the pigment in the binary mixture significantly slower. The observed results indicate that the rate limiting step in the excited state dynamics of the pigment in toluene-polar solvent mixtures might be the formation and reorganization of the intermolecular H-bonding between the keto group of the pigment and the H-bond donating property of the polar solvent. However as noted in Chapter-3, a significant part of the solvation dynamics (~30%) could not be observed due to limited time resolution (~40 ps) of the TCSPC setup. Therefore fluorescence upconversion experiments with 150-200 femtosecond time resolution can provide with more information about the IHB reorganization process of the pigment in the excited state. In addition time resolved (with femtosecond time resolution) infrared spectroscopic investigations which can probe the C=O and O-H stretching vibrations of the pigment are expected to provide further information about the IHB reorganization.
The second part of this thesis work involves investigating the interaction of \( \text{Cp}_6 \) and Curcumin with lipid bilayer by SH spectroscopy.

The diffusion characteristic of the photosensitizer \( \text{Cp}_6 \) across an egg lecithin membrane was observed to depend upon the pH of the medium. However, some of the results, especially the origin of the 50s decay observed at pH 6 and the origin of the slow growth in SH signal observed at pH 5 are not yet fully understood. To understand these aspects further investigations on the relative amounts of different ionic species of the drug present at the different pH and the relationship between the diffusion of \( \text{Cp}_6 \) and the surface charge of liposomes are needed.

Finally the results obtained on the effect of liposomal Curcumin and liposomal \( \text{Cp}_6 \) on the diffusion kinetics of two organic cations shows a substantial pH effect. Based on the results obtained from earlier studies this was attributed to the increased interaction between the drug and the polar head groups of the lipid at pH 7.4 where the drug resides closer to the lipid-water interface. In order to understand the interaction of the drug with the polar head groups of the lipid molecules more studies are required. Since both drugs are fluorescent, fluorescent based techniques like resonance energy transfer are expected to give a better idea about the localization of the drug in the bilayer region. Additionally other techniques like FTIR, NMR etc can also provide information on this aspect.