Investigation of structure of reverse micelles on the basis of Brij-30 and AOT by using of o-nitroaniline as optical probe

***Manoni Kurtanidze*, Rusudan Chaladze, Marina Rukhadze**

Department of Chemistry, Faculty of Exact and Natural Sciences, 3, I.Chavchavadze ave, Tbilisi, 0179, Georgia

**E-mail manoni.kurtanidze524@ens.tsu.edu.ge*

Keywords: water-in-oil microemulsions, o-nitroaniline, interfacial binding sites, solubilisation, confined water, kosmotropic and chaotropic anions.

Considerable attention has been paid to reverse micellar systems in recent years. Reverse micelle systems can be considered as intermediate systems between complex biological water cavities and wall pores in solid media. They are resembled to pockets of water included in bioaggregates such as membranes and mitochondrial matrix, where water is not in its bulk state but confined to small cavities whose size and wall nature determine the way of water organisation.

Several features of reverse micelles remain to be solved, e.g. water structure close to the interface, water activity and internal pH in the water nanocage. Ionic reverse micelles represent a good model to study the properties of water aggregates close to the ionic center [1-2]. Investigations of structure of water pools of reverse micelles by introducing of ions in the water pockets is also important due to ion-water interactions.

The purpose of the presented work was to study the interactions of o-nitroaniline with reverse micelles of polyoxyethylene (4) lauryl ether (Brij 30) and sodium 1,4-bis (2-ethylhexyl) sulfosuccinate (AOT) in hexane. Revealing of influence of concentration of surfactant, water, additives of kosmotropic and chaotropic anions on the changes in electronic absorption spectra of o-nitroaniline was also an aim of the present work.

Increasing of concentration of AOT results in the bathochromical shift of absorption maxima of o-nitroaniline. When concentration of AOT is greater than 0.1 M, the absorption spectrum of o-nitroaniline remains unchanged. Investigations show, that kosmotropic and chaotropic ions influence bathochromical shift of electronic spectrum o-nitroaniline in reverse micelle of AOT differently (Table1).

Table 1. Absorption maxima of o-Nitroaniline at different composition of reverse micellar solutions

Concentration of AOT in hexane	λ_{max} of o-Nitroaniline, nm					
	AOT+ hexane	AOT+ hexane+ perchlorate	AOT+ hexane +acetate	AOT+ hexane +H_2O W_o=7	AOT+ hexane + H_2O+ perchlorate W_o=7	AOT+ hexane +H_2O +acetate W_o=7
0.00 M AOT	378	377	375	376	378	377
0.01 M AOT	382	384	380	378	382	380
0.02 M AOT	384	388	386	384	386	384
0.03 M AOT	386	390	388	386	388	386
0.05 M AOT	392	393	390	387	394	391
0.10 M AOT	399	399	396	398	397	397

Binding constants of o-nitroaniline with Brij-30 and AOT reverse micelles were calculated for pure water, also in the presence of acetate and perchlorate anions in the water nanocages.

Results may be useful in the investigations of structure of confined water in biological systems.

References

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