Study of Structure of Water Droplets of Mixed Reverse Micelles

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The reverse micelles, as well as direct micelles, are successfully used for modeling of biological membranes. Modification of nonionic reverse micelles with ionic surfactants is topical in order to enhance resemblance of these systems to natural cell membranes via introducing of polar groups to the water-surface interface. The additives of bile salts are of special interest. It is known that bile acids are biological surfactants and their application spectrum in micellar systems is wide, viz. as micellar mobile phases and additives in micellar and biopartitioning liquid chromatography respectively, for an enhancement of drug absorption and transmembrane transport, as well as in the process of self-aggregative organic gel formation as an organogelator, etc [1-4].

The purpose of the presented work was study of influence of structure of the water droplets of mixed micelles based on polyoxyethylene (4) lauryl ether (Brij30) and sodium salt of cholic acid.

The microstructure of Brij-30 reverse micelles at different concentrations of sodium cholate was investigated with an infrared spectroscopy method. Deconvolution of the O-H stretching vibrational absorption spectra in the region of 3000-3800 cm^{-1} into three subpeaks (free, bound and trapped water fractions) with a Gauss fitting program and Monte Carlo method was accomplished. Results show, that suppression of free water fraction takes place in the water pockets of the reverse micelles with increasing of concentration of sodium salt of cholic acid.

The microenvironment of mixed reverse microemulsions (Brij-30 + sodium cholate) is investigated with an ultraviolet-visible spectroscopy by using of ortho-nitroaniline and methyl orange as molecular probes. The values of binding constants and association degrees of ortho-nitroaniline and methyl orange with Brij-30 reverse micelles at different concentrations of sodium cholate were determined.

Results may be useful in the investigations of water structure, when it is confined to nanometer-scale cavities. Results may be informative in the application of reverse micelles in the field of drug delivery.

References:

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