INTERACTIONS OF $\beta$-CYCLODEXTRIN WITH IONIC DETERGENTS

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SUMMARY

Association constants of $\beta$-cyclodextrin with 3 derivatives of cationic surfactants N,N'-bis[4-aryloxy/butyldimethyl]-1,6-hexanediамmonium dibromid, namely 1-naphtoxy-, 2-naphtoxy and p-tert.бutoxyderivative, estimated at 20°C are 501 ±178 1M$^{-1}$, 629 ±93 1M$^{-1}$, 1743 ±200 1M$^{-1}$ respectively. The surface activity of aqueous solutions of these derivatives in the presence of CD is lowered and critical micelle concentration /CMC/ is shifted to the higher concentrations. Such a shift of CMC for these surfactants was observed also using solubilization study.

Interactions of CD with $\beta$ cationic surfactants of the type N,N'-bis/alkyldimethyl/-1,6-hexanediамmonium dibromid /alkyl = nonyl bis hexadecyl/ were studied by spectrophotometry in the presence of methyIorange /MO/. Absorption spectrum of MO is influenced by the interaction of CD with surfactant molecule and the degree of spectral changes depends on the association of surfactant molecules. This effect can be used for investigation of association process in the system MO-surfactant as well as in the system MO-surfactant-CD /C_{CD} = const./. In the presence of CD of aqueous surfactant solutions is shifted to the higher concentrations, and the measure of this shift is proportional to the interaction of components. Ratio of CD bound to one surfactant molecule, evaluated from the CMC shift is lowered with lengthening of alkyl part of molecules. Analogous results were obtained using conductometric method.
INTRODUCTION

The interaction of surface-active compounds with β-cyclodextrin and the formation of inclusion complexes present an interesting field of study with respect to their influence on the physico-chemical properties of these compounds. The cationic surfactant - β-cyclodextrine complexes were also studied by Japanese chemists /1,2/.

The present study is aimed at obtaining experimental information on the interactions of β-CD with quaternary bis-ammonium salts having long alkyl- and aryloxy-chains, with special orientation to the problem of the surface-active and solubilizing properties of these cationic surfactants, and their electric conductivity.

EXPERIMENTALS

Materials used:

The homologous series of cationic surfactants of the following types: N,N'-bis-alkyldimethyl-1,6-hexanedi/ammonium dibromide (alkyl: nonyl- /NoDiBr/; decyl- /DeDiBr/; undecyl- /UnDiBr/; dodecyl- /DoDiBr/; tridecyl - /TriDiBr/; tetradecyl- /TeDiBr/; pentadecyl- /PeDiBr/; hexadecyl- /HeDiBr/); as well as N,N'-bis-[4-aryloxy/butyldimethyl]-1,6-hexanedi/ammonium dibromide (aryloxy: 1-naphthoxy- /1-NaphDiBr/; 2-naphthoxy- /2-NaphDiBr/; 4-tert.butylphenoxy- /TebDiBr/), were synthesized at the Pharmaceutical faculty of Komenský University, Bratislava /3/.

β-cyclodextrin /CD/ /90.14% dry solids content/ produced by Chinoin Budapest.

Methyl orange /MO/ as well as pyrene, supplied by Lachema, Brno.

Methods:

Spectrophotometric determination of association constants of the surfactant-CD complex: Absorption spectra of the pure components as well as of the complexes were registered on a double-ray SPECORD spectrophotometer /type UV VIS, Zeiss, Jena/ at 20°C. Ketelaar's equation /4/ has been used to calculate the complex' association constants. This equation is a