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EFFICIENCY OF THE INTERMOLECULAR INTERACTION OF SALICYLIC ACID NEUTRAL FORM AND MONOANION WITH Cd^{2+} ION STUDIED BY METHODS OF ABSORPTION AND FLUORESCENCE

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Abstract

The methods of absorption and fluorescence were used to study the efficiency of the interaction between salicylic acid derivatives SAD (neutral SA form and SA monoanion) and Cd^{2+} ions (in $CdBr_2$ salt) within the range pH = 1.5 ÷ 8. The efficiency was determined from the change in both the absorption band contour and the fluorescence intensity of various SAD forms. It has been established that depending on the SAD form, the addition of $CdBr_2$ to a starting solution leads to the formation of additional absorption for both the shorter wave lengths in the absorption spectrum of the neutral form (at pH < 3) and the longer wave lengths in the absorption spectrum for the $HSal^-$ monoanion (at pH > 4). In the fluorescence spectra, the intensity was observed to increase for the neutral SAD form (at pH< 3) and to decrease for the $HSal^-$ monoanion (at pH > 4) after addition of $CdBr_2$.

The spectral changes were interpreted in the framework of common notions about the effect of three physicochemical factors that determine the interaction between the SAD and the Cd^{2+} ion and affect the parameters of absorption and fluorescence spectra. These factors are: (1) the decrease in pH after addition of $CdBr_2$ to the SAD solution, (2) the decrease in the efficiency of the H-bonding of SAD molecules to the water ones, and (3) the existence of electrostatic ion-ion interaction between the $HSal^-$ monoanion and the Cd^{2+} ion.

The bimolecular fluorescence quenching constants K_q of $HSal^-$ monoanion fluorescence quenching by the Cd^{2+} ion appeared to be substantially less than those of the quenching which would follow either the dynamic (diffusion) or the concentration (static) mechanisms.

Key words: salicylic acid; salicylic acid derivatives SAD; Cd^{2+} ion; absorption spectra; fluorescence spectra; fluorescence quenching; ion-ion interaction.

1. Introduction

The study of the physicochemical properties of the biologically active molecules, that are used in medicine, has always been of scientific interest. Salicylic acid, SA (2 - hydoxibenzoic or phenol acid, $C_6H_4(OH)COOH$, H_2Sal) , is one of these molecules. This acid and its derivatives are widely employed in pharmaceutical industry to produce anticeptics, disinfecting substances, antirheumatic and antifebrile substances [I]. It is noteworthy that the search for novel biologically active compounds on