

Spectroscopic Study of Heterogeneous Associate Formation in Rhodamine B and Rhodamine S Solutions with Gossipol

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Rhodamines are widely used in optical quantum generators as active media and passive breech pieces, in analytical chemistry to determine the micro-quantities of various elements, and in medicine and biology as luminescent probes and labels. Depending on the solvent nature, they can be present in different noncolored (lactone, carbinole, etc.) and colored (cationic, associated, protonated, etc.) forms, each of which is characterized by certain absorption spectra, and some of which are also characterized by luminescence spectra [1]. In most cases, in practice, when a dye mixture is used, there is the probability of an associated molecular formation, which can consist of molecules of the same substance: homogeneous associates (HA), and of molecules of different substances: heterogeneous associates (HtA). Therefore, the study of dye molecular association processes in solution is both theoretical and practical interest.

In this work, the result of the HtA formation between rhodamine B (RB), rhodamine S (RS) molecules with gossipol molecules in organic solvents at room temperature is presented.

When dissolving rhodamine dyes with carboxylic groups in proton acceptor and amphoteric solvents (dimethylsulfoxide, dimethylformamide), with a dye concentration decrease, there is also a decrease in the absorptive and fluorescent abilities of the solution, i.e., a discoloring of the solution is observed. This process is connected with the transition of the dye molecules in their lactonic form [1].

It was found that the addition of a gossipol solution into the same solvent as the rhodamine solution leads to the appearance of solution color and, hence, to the re-establishment of the solution's absorptive and fluorescent abilities, which are typical for the cationic form of the dye molecules. Moreover, the addition of a gossipol solution to RB and RS solutions in proton donor solvents leads to a bathochromic shift in the absorption and fluorescence spectra by about 7 nm. The observed spectral changes in both the proton acceptor and proton donor solvents were explained by the HtA formation between the RB and RS molecules with molecules of gossipol.

- [1] N. Nizomov, *Luminescence of organic dye associated molecules in solutions and films*, Samarkand, Ed.: Zarafshon, 145 (1997).