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A Partition Equilibrium Study of Sulfonephthalein Dyes in Nonionic Surfactant Systems at High *p*H

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Abstract - The acid base equilibria of two sulfonephthalein dyes, viz., bromothymol blue (BTB) and bromocresol green (BCG) in aqueous nonionic micellar solutions of Triton X100, Tween 20, Tween 40, Tween 60 and Tween 80 have been investigated spectroscopically using a partition equilibrium method. A red shift in the $?_{max}$ of the visible absorption band corresponding to the base forms of the dyes with increase in surfactant concentration was observed at and above pH 9.0. For a particular dye-surfactant system the red shift increases with the increase in pH and was found to be greater for TX 100 than for the Tween surfactants. Red shift of the ?max of BTB was observed to be greater than that of BCG in all of the nonionic micellar systems investigated in buffered medium. The observed red shift has been attributed to stabilization of the base form of the dye by the polyoxyethylene (POE) head groups. The stabilization effect was found to decrease with increase in the number of carbon atom and unsaturation in the hydrophobic tail of the surfactant molecules. The equilibrium constant of the partition of the dyes between micellar and aqueous pseudophases (K_{ass}) was found to be greater for the more hydrophobic BTB than the less hydrophobic BCG. With the surfactants the K_{ass} increases in the order Tween 80 < Tween 60 < Tween 40 < Tween 20 < TX 100. The pK_{a2} of the dyes were predicted using a partition equilibrium model and found to be in good agreement with the experimental values.

Keywords : Sulfonephthalein dyes, partition equilibrium, nonionic surfactant, micelle and acid-base equilibrium.

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