World Academy of Science, Engineering and Technology
International Journal of Chemical and Molecular Engineering
Vol:10, No:01, 2016

Photophysics and Rotational Relaxation Dynamics of 6-Methoxyquinoline Fluorophore in Cationic Alkyltrimethylammonium Bromide Micelles

Authors : Tej Varma Y, Debi D. Pant

Abstract : Photophysics and rotational dynamics of the fluorescent probe, 6-methoxyquinoline (6MQ) with cationic surfactant, alkyltrimethylammonium bromide (nTAB) micelle solutions have been investigated (n = 12, 14 and 16). Absorption and emission peaks of the dye have been observed to shift at concentrations around critical micellar concentration (cmc) of nTAB compared to that of bulk solutions suggesting probe is in a lower polar environment. The probe senses changes in polarity (ET (30)) brought about by variation of surfactant chain length concentration and is invariably solubilized in the aqueous interface or palisade layer. The order of change in polarity observed was DTAB > CTAB > TTAB. The binding constant study shows that the probe binds strongest with TTAB (is of the order TTAB > CTAB > DTAB) due to deeper penetration into the micelle. The anisotropy decay for the probe in all the nTAB micelles studied have been rationalized based on a two-step model consisting of fast-restricted rotation of the probe and slow lateral diffusion of the probe in the micelle that is coupled to the overall rotation of the micelle. Fluorescence lifetime measurements of probe in the cationic micelles demonstrate the close proximity of the 6MQ to the Br - counterions. The fluorescence lifetimes of TTAB and DTAB are much shorter than in CTAB. These results indicate that 6MQ resides to a substantial degree in the head group region of the micelles. All the changes observed in the steady state fluorescence, microenvironment, fluorescence lifetimes, fluorescence anisotropy, and other calculations are in agreement with each other suggesting binding of the cationic surfactant with the neutral dye molecule.

Keywords : photophysics, chain length, ntaB, micelles
Conference Title : ICP 2016 : International Conference on Photochemistry
Conference Location : Zurich, Switzerland
Conference Dates : January 12-13, 2016