Chemosensing Probed at Single Molecule Resolution by Micelles Entrapped Cresyl Violet

Nirmal Kumar Das, and Sapratshi Mukherjee*

Department of Chemistry, IISER Bhopal, Madhya Pradesh, INDIA
(E-mail: nirmal@iiser.ac.in & saptarshi@iiser.ac.in)

Abstract:

In the present study, we have reported the photo-physical dynamics of the cationic fluorophore, Cresyl Violet (CV) in anionic, cationic and neutral micellar systems using several spectroscopic measurements. The association of the probe, CV into the anionic micelle, SDS is mainly driven by electrostatic interactions.[1] In contrast, in the case of cationic micelle, DTAB there is a marginal interaction which was observed due to charge repulsion phenomenon. A static complex formation took place between CV and neutral micelles, TX-100. The dynamic interaction of CV in different micellar systems has been demonstrated in single molecular level by Fluorescence Correlation Spectroscopy (FCS). The micelles entrapped CV exhibits potential and versatile metal ion sensing behaviours; the SDS micelle entrapped CV efficiently detected Cu^{2+} ions in solution with a limit of detection (LOD) of 70 nM. This selective Cu^{2+} ion sensing behavior was well substantiated with the gradual enhancement of the translational motion of the probe as observed by our FCS studies. The CV entrapped in the DTAB micelles could selectively detect Hg^{2+} ions in solution with a LOD of 35 nM. The weak interactions (metal-ligand co-ordination) are primarily responsible for this fluorescence "turn-on" response in the case of Hg^{2+} ions which was again illustrated by our FCS measurements.[2] The micelle encapsulated CV was effective in detecting these metal ions in real water samples from different sources.[3]

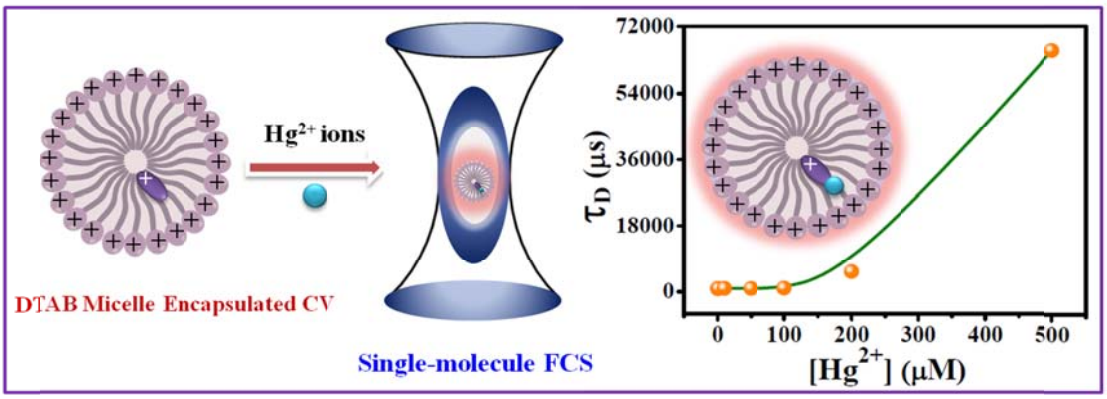

Figure 1: Schematic representation of detection of Hg^{2+} ions by DTAB micelle entrapped Cresyl Violet using single-molecule FCS technique.

References and Notes:

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3. Ghosh, S.; Anand, U.; Mukherjee, S. *Anal. Chem.* **2014**, *86*, 3188-3194.