Electronic Supporting Information

Supramolecular Platform Assisted Selective Recognition of Uric Acid with High Sensitivity via Microenvironment Modulation of a Self Assembled Probe

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Materials

All the solvents (acetonitrile, water) used in the experiments were ofspectroscopic grade and purchased from Spectrochem (India). Cetyltrimethylammonium bromide, Uric Acid, were purchased from TCI (India) and HEPES buffer from Sigma-Aldrich (USA). All the other chemicals were purchased from TCI (India) and used as received. BIPM was synthesized as mentioned elsewhere.[13] The stock solution of BIPM was prepared in acetonitrile with a concentration of 5 mM. For the additions of surfactant within the BIPM solution, the mixtures were stirred well for 5 mins employing a magnetic stirrer and kept still for ~2 mins to achieve homogeneous and thermally equilibrated solutions required for spectroscopic measurements. HEPES buffer was prepared in doubly distilled de-ionized water using standard protocol and maintaining pH at ~ 7.4.

Experimental Methods

Steady-state spectroscopic measurements

The steady-state absorption and emission spectra were recorded on UH-5300 (Hitachi, Tokyo, Japan) spectrophotometer and F-7000 (Hitachi, Tokyo, Japan) spectrofluorometer, respectively. The F-7000 spectrofluorometer was housed with a 150 W xenon lamp as source and L-type single excitation and single emission monochromator setup. Throughout the steady-state fluorescence measurements, the slit ratio was kept 1 (Ex slit = 5 nm, Em slit = 5 nm). The emission spectrum is scanned from 300 to 600 nm with a scan speed of 1200 $nm.min^{-1}$. The photomultiplier voltage is set at 400 V. The steady-state fluorescence anisotropy measurements were performed on a Horiba Fluoromax-4 (Jobin Yvon, California, USA) spectrofluorometer where the excitation and emission slits were kept 6 nm.

Time-Resolved emission measurements

A Horiba Jobin Yvon Fluorocube instrument was employed to perform time-resolved emission measurements. A 280 nm excitation source with 1 ns IRF was employed during the decay measurements. The monitoring wavelength was set at the corresponding emission maxima of BIPM at different environment. For the lifetime measurements, the time-correlated single photon counting (TCSPC) method was considered. For the fitting of decay curves, the nonlinear least-squares iterative reconvolution procedure using IBH DAS6 (Version 2.2) was employed using suitable exponential decay equations. The near-unity $\chi 2$ values assessed the goodness of fittings.

Field emission scanning electron microscopy (FESEM)

The FESEM images were taken in a Carl Zeiss SUPRA 55VP field emission scanning electron microscope. 20 µL of the aqueous solutions of required concentration for each sample were drop casted on a silicon wafer and dried prior to the imaging.

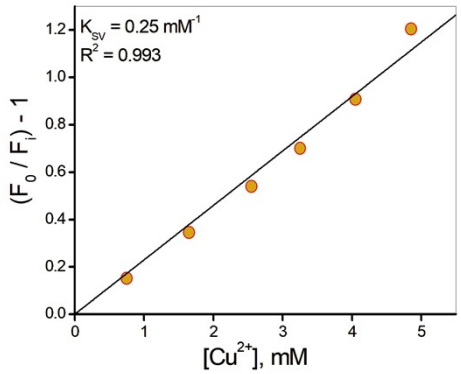


Fig. S1 Plot of $(F_0/F_i) - 1$ vs $[Cu^{2+}]$ for BIPM–CTAB mixture in water. [BIPM] = 30 μM, λ_{ex} = 280 nm, Temp. 298K.

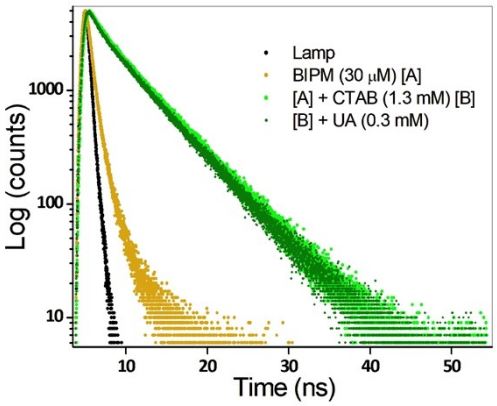


Fig. S2 Lifetime decay plot of BIPM in presence of CTAB and CTAB–UA mixture in water. [BIPM] = 30 μM, λ_{ex} = 280 nm, Temp. 298 K.

Table S1. Time-Resolved Decay Parameters of BIPM on Excitation at 280 nm and Monitoring at respective Emission Maxima, Temp. 298K.

System	τ_1, ns	A_1	τ_2, ns	A_2	τ_{av}, ns	χ^2	r	τ_c, ns
BIPM*	0.25	70.27	1.36	29.73	1.02	1.27	0.21	1.10
BIPM + CTAB (1.3 mM)	1.45	9.59	5.25	90.41	5.14	1.08	0.007	0.09
BIPM + CTAB (1.3 mM) + UA (0.3 mM)	0.81	11.37	5.05	88.63	4.96	1.18	0.075	1.14

* Data taken from *Ref. 13*.

τ_{av} = average lifetime; calculated using $\tau_{av} = [(A_1\tau_1^2 + A_2\tau_2^2)/ (A_1\tau_1 + A_2\tau_2)]$

r = anisotropy; **χ^2** indicates the quality of fittings; **τ_c** = rotational correlation time, calculated using $\tau_c = (\tau_f \times r) / (r_0 - r)$.

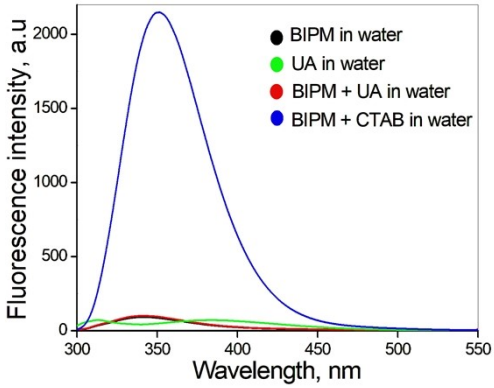


Fig. S3 Steady state emission spectra of BIPM and BIPM–UA mixture in water. [BIPM] = 30 μM, λ_{ex} = 280 nm, Temp. 298K.

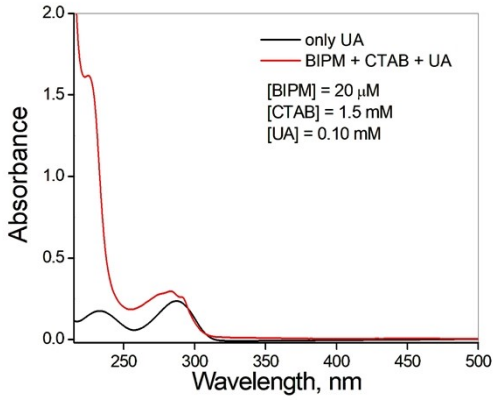


Fig. S4 UV-Vis absorption of UA exclusively and of BIPM in presence of CTAB–UA mixture in water. [BIPM] = 20 μM, Temp. 298K.

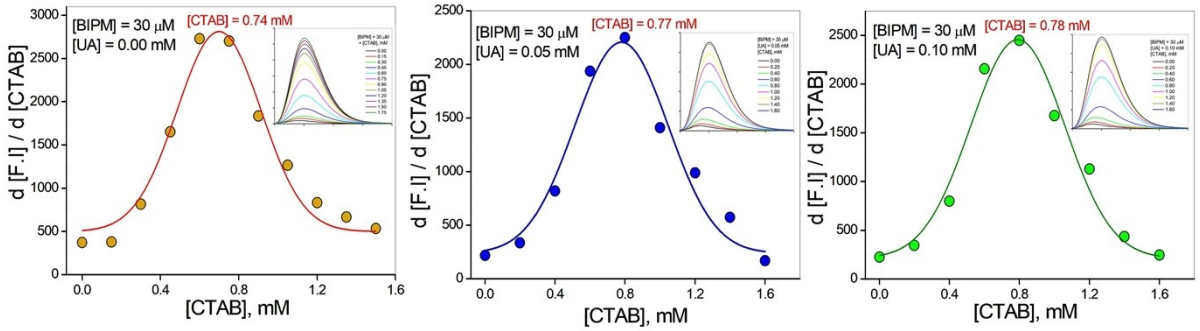


Fig. S5 Plot of d[FI]/d[CTAB] for BIPM-CTAB emission in (a) 0.0 mM UA; (b) 0.05 mM UA and (c) 0.10 mM UA respectively, to study the effect of UA on cmc of CTAB. [BIPM] = 30 μM, λ_{ex} = 280 nm, Temp. 298K.

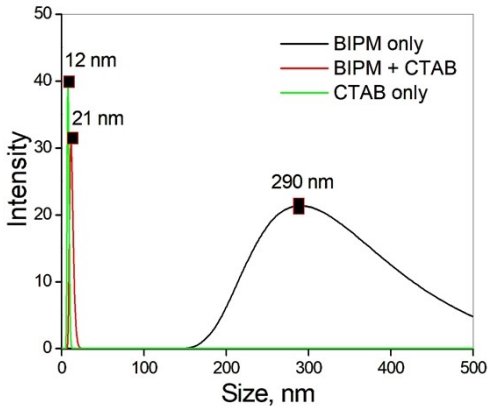
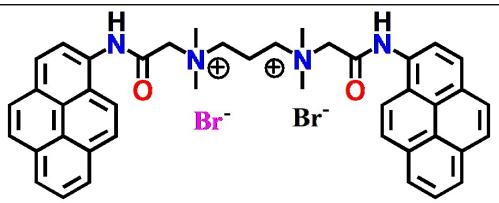
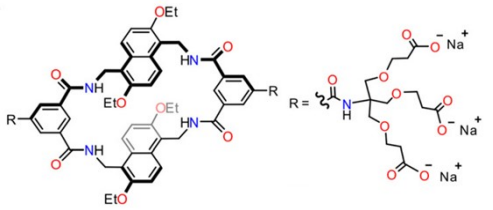


Fig. S6 Particle size distribution of BIPM aggregates in pure H_2O and in CTAB micellar system, as measured from DLS studies. [BIPM] = 25 µM; temp. 298 K.

Table S2. Comparison of different Uric acid sensors containing the structure/material of the sensor, method of detection, linear range of detection, detection limit (LOD) and time required.

Serial No.	**System/Molecule**	**Method of Detection**	**Linear range of detection**	**Limit of detection (LOD)**	**Time required**	**Ref.**
1.	2,2'-[1,2-ethanediylbis(nitriloethylidyne)]-bis-hydroquinone-modified carbon-nanotube-paste-electrode (EBNBHCNPE)	Differential Pulse Voltammetry (DPV)	20 – 650 µM	15 µM	----	[S1]
2.	Ion-exclusion chromatography using HEMA-BIO 1000 SB analytical column	HPLC–UV	10 – 500 µM	0.426 µM	~10 mins	[S2]
3.	Nitrogen-doped zinc oxide thin film (ZnO:N) based bio-electrode	Cyclic Voltammetry (CV)	50– 1000 µM	40 µM	~1 min	[S3]
4.	A hybrid nanomaterial consisting of 3, 3', 5, 5'–tetramethylbenzidine (TMB) and Ni@MnO_2	Colorimetry	1 – 40 µM	0.24 µM	~30 mins	[S4]
5.	Colloidal Gold Nanoparticles (GNP) substrate	Surface-enhanced Raman Spectroscopy (SERS)	0 – 3500 µM	110 µM	~30mins	[S5]
6.	Poly-(vinylpyrrolidone)-protected gold nanoparticles (PVP-AuNPs) and Chondroitin sulfate-stabilized gold nanoclusters (CS-AuNCs) as absorber/fluorophore pair	Fluorescence	5 – 100 µM	1.7 µM	~60 mins	[S6]

7.		Ratiometric change in Fluorescence	0 – 3.6 µM	0.00073 µM	~5 mins	[S7]
8.	Pb (II)-based metal-organic nanotube (CD-MONT-2)	Fluorescence	2.5 – 9.1 µM	4.3 µM	----	[S8]
9.	2-Hydroxybenzimidazole Modified Carbon Paste Electrode [MCPE]	Cyclic Voltammetry (CV)	10 – 70 µM	5.1 µM	----	[S9]
10.	Agilent TC-C18 Column	HPLC-VWD (Variable Wavelength Detector Method)	0.3 – 600 µM	0.01 µM	~ 20 mins	[S10]
11.	Glassy carbon electrode (GCE) modified with copper nanoparticles/ polydopamine–Cu/ graphene to form CuNPs/ Cu (II)-PDA/Gr film	Cyclic Voltammetry (CV)	11.8 – 434 µM	6.2 µM	----	[S11]
12.	1-H-3-methylimidazolium acetate (ionic liquid, IL)-capped nickel nanoparticles (NiNPs)	Colorimetry	0.01–2.4 µM	0.13 µM	~ 4 mins	[S13]
13.	Blue Emissive Carbon Dots Entrapped in Chromium Metal–Organic Frameworks (Cr-MOF)	Fluorescence	20 – 50 µM	1.3 µM	~ 15mins	[S13]
14.		Fluorescence	0 – 90 µM	1.23 µM	---	[S14]
15.	BIPM–CTAB micellar mixture	Fluorescence	50 – 200 µM	6.09 µM	~3 mins	**This report**

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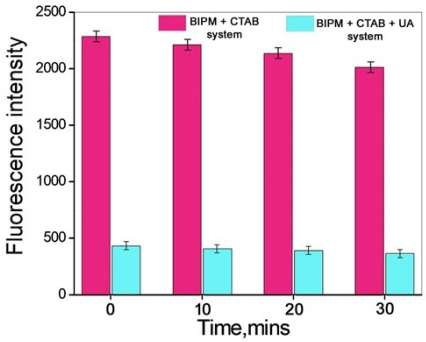

Fig. S7 Emission intensity of the BIPM-CTAB and BIPM-CTAB-UA mixture at different time intervals, depicting the reproducibility of the results with ± 5% error limit. [BIPM] = 30 μM; [CTAB] = 2 mM; [UA] = 0.25 mM; λ_{ex} = 280 nm, Temp. 298K.