

What Kind of Nanoscopic Environment a Cationic Fluorophore Experiences in Room Temperature Ionic Liquids?

Anup Ghosh, Chayan K. De, Tanmay Chatterjee, and Prasun K. Mandal*

Department of Chemical Sciences, Indian Institute of Science Education and Research (IISER) - Kolkata,
Mohanpur, West-Bengal, 741246, India. e-mail: prasunchem@iiserkol.ac.in

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S1:

(a) Absorption spectrum of Rhodamine 6G (blue) and emission spectra of emim[FAP] [$\lambda_{\text{ex}}=377\text{nm}$ (black), $\lambda_{\text{ex}}=402\text{nm}$ (red)]

(b) Absorption spectrum of Rhodamine 6G (red) and emission spectra of bmim[FAP] [$\lambda_{\text{ex}}=377\text{nm}$ (black), $\lambda_{\text{ex}}=402\text{nm}$ (red)]

(c) Absorption spectrum of Rhodamine 6G (blue) and emission spectra of hmim[FAP] [$\lambda_{\text{ex}}=377\text{nm}$ (black), $\lambda_{\text{ex}}=402\text{nm}$ (red)]

(d) Absorption spectrum of Rhodamine 6G (blue) and emission spectra of hmim[PF₆] [$\lambda_{\text{ex}}=377\text{nm}$ (black), $\lambda_{\text{ex}}=402\text{nm}$ (red)]

(e) Absorption spectrum of Rhodamine 6G (blue) and emission spectra of hmim[BF₄] [$\lambda_{\text{ex}}=377\text{nm}$ (black), $\lambda_{\text{ex}}=402\text{nm}$ (red)].

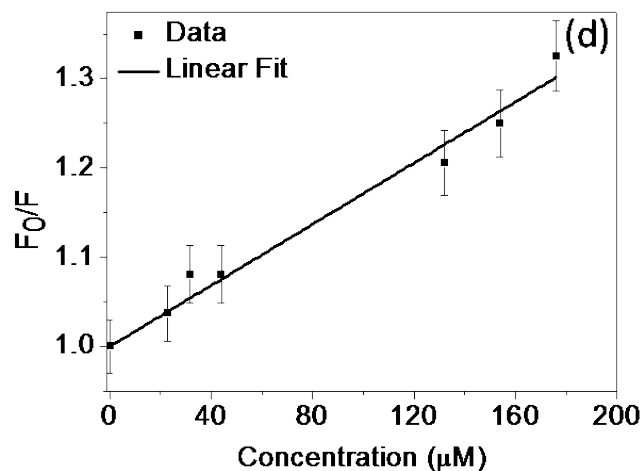
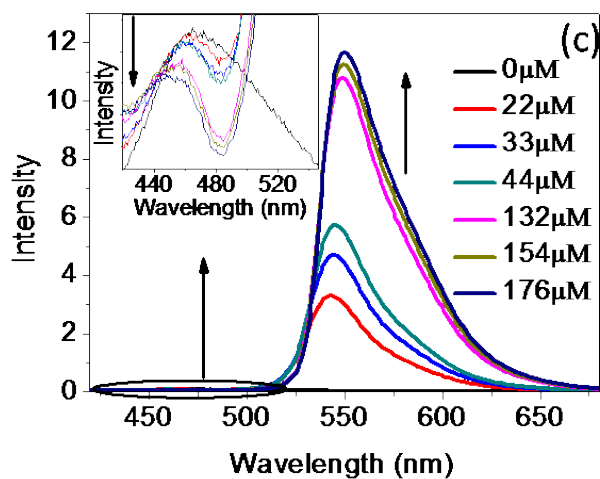
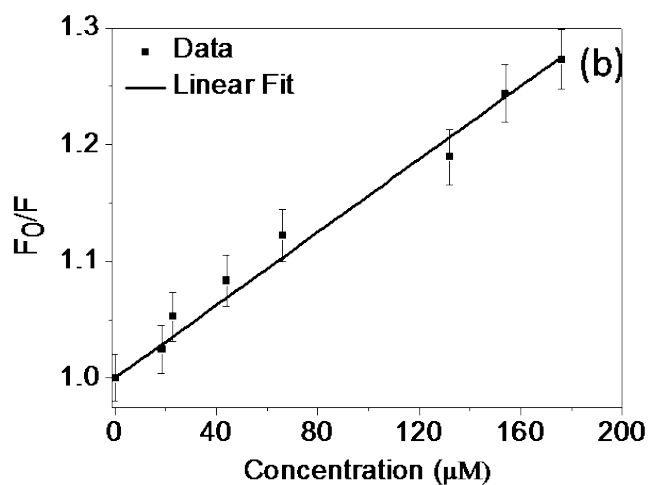
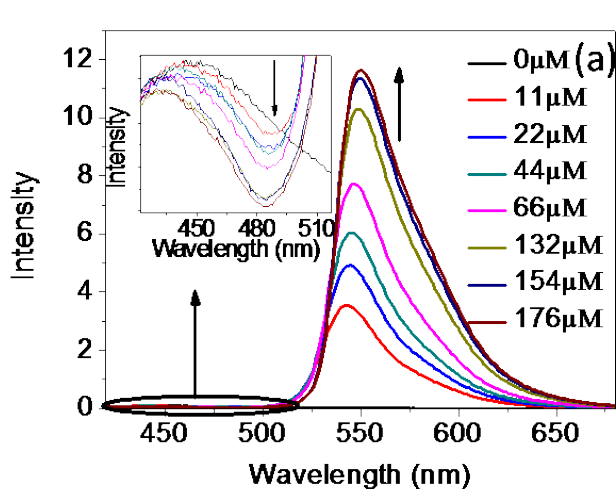
S2:

(a): Steady state fluorescence emission spectra of emim[FAP] in presence of different concentrations of Rhodamine 6G [$\lambda_{\text{ex}}=377\text{nm}$]

(b): Stern-Volmer plot of emim[FAP] in presence of different concentrations of Rhodamine 6G [$\lambda_{\text{ex}}=377\text{nm}$]

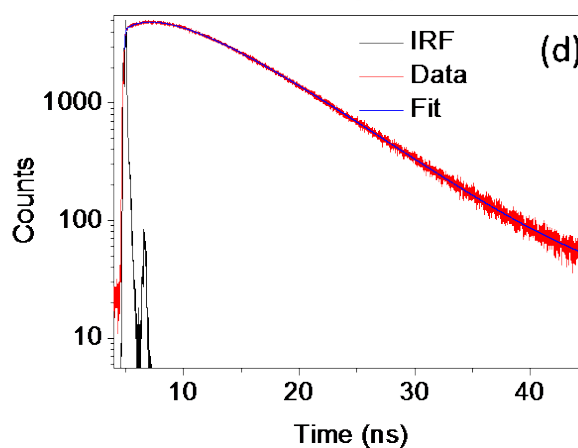
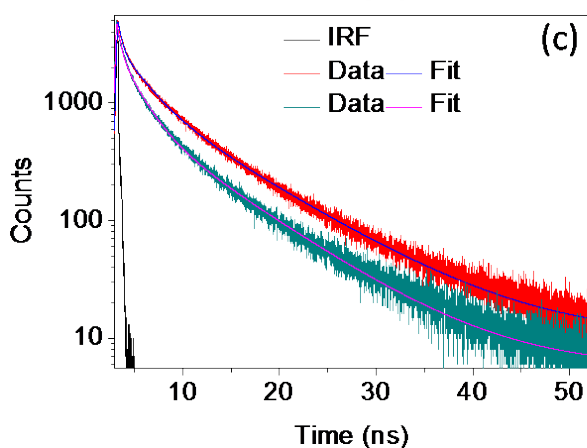
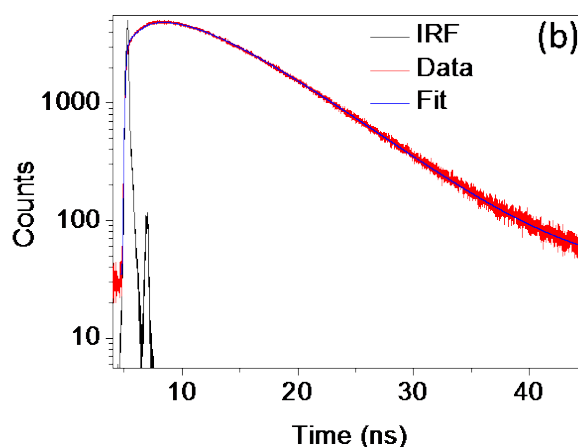
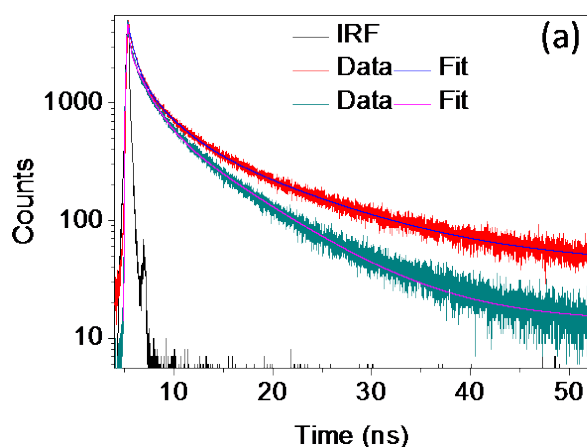
(c): Steady state fluorescence emission spectra of emim[FAP] in presence of different concentrations of Rhodamine 6G [$\lambda_{\text{ex}}=402\text{nm}$]

(d): Stern-Volmer plot of emim[FAP] in presence of different concentrations of Rhodamine 6G [$\lambda_{\text{ex}}=402\text{nm}$]



S3:

- (a): Fluorescence decay curves of emim[FAP] in absence (red) and in presence of Rhodamine 6G (conc.=55 μ M, green) [λ_{ex} =377nm, λ_{em} =450nm]
- (b): Fluorescence decay curve of Rhodamine 6G (conc.=55 μ M) in emim[FAP] [λ_{ex} =377nm, λ_{em} =560nm]
- (c): Fluorescence decay curves of emim[FAP] in absence (red) and in presence of Rhodamine 6G (conc.=55 μ M, green) [λ_{ex} =402nm, λ_{em} =450nm]
- (d): Fluorescence decay curve of Rhodamine 6G (conc.=55 μ M) in emim[FAP] [λ_{ex} =402nm, λ_{em} =560nm]



S4:

(a) Time constants of fluorescence decay of emim[FAP] in presence of different concentrations of Rhodamine 6G

λ_{ex} (nm)	λ_{em} (nm)	Conc. (μM)	τ_1 (ns)	B_1	τ_2 (ns)	B_2	τ_2 (ns)	B_3	$\langle\tau\rangle$ (ns)	χ^2
377	450	0	0.870	15.71	3.54	25.5	12.65	58.79	8.48	1.01
		11	0.73	15.06	3.10	30.75	11.92	54.19	7.52	1.01
		22	0.69	13.18	2.97	31.10	10.99	55.72	7.13	1.07
		33	0.49	12.81	2.31	30.04	10.21	57.15	6.59	1.20
		44	0.63	15.74	2.44	30.67	10.10	53.58	6.25	1.14
		55	0.14	7.19	1.63	34.04	7.40	58.76	4.91	1.33
402	450	0	0.38	7.51	2.83	32.64	9.04	59.84	6.37	1.20
		11	0.36	7.31	2.44	31.33	8.32	61.36	5.89	1.26
		22	0.56	9.23	2.54	38.39	8.32	52.46	5.38	1.07
		22	0.25	7.95	2.09	37.78	8.02	54.27	5.16	1.26
		33	0.22	7.69	2.00	36.70	7.80	55.61	5.08	1.25
		44	0.26	8.93	1.84	36.69	7.48	54.37	4.76	1.30
		44	0.25	6.59	1.55	33.60	6.63	59.81	4.50	1.30
		55	0.41	17.96	1.21	40.52	6.59	41.51	3.29	1.20

(b): Time constants of fluorescence decay of Rhodamine 6G (different concentrations) in emim[FAP]

λ_{ex} (nm)	λ_{em} (nm)	Conc. (μM)	τ_1 (ns)	B_1	τ_2 (ns)	B_2	χ^2
377	550	22	4.16	-224.4	4.83	324.4	1.05
		33	4.16	-175.5	5.27	275.5	1.07
		44	4.16	-124.7	5.61	224.7	1.06
		55	4.20	-165.7	6.00	265.7	1.08
450	550	22	4.11	-248.9	4.88	348.9	1.06
		33	4.14	-173.9	5.29	273.9	1.10
		44	4.17	-167.7	5.65	267.7	1.12
		55	4.14	-128.7	6.05	228.7	1.02

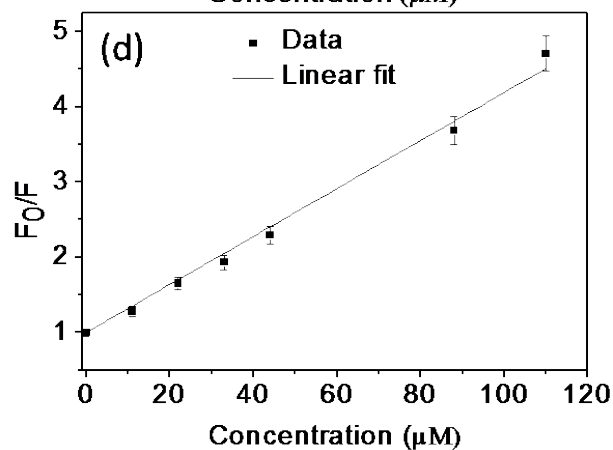
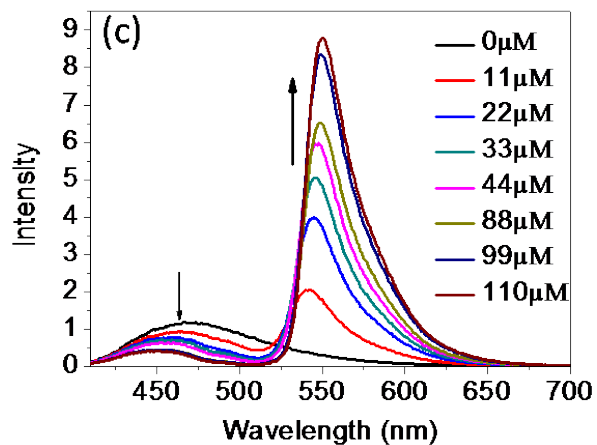
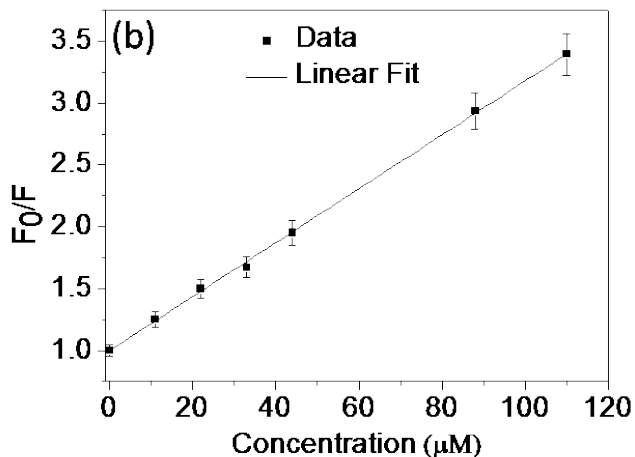
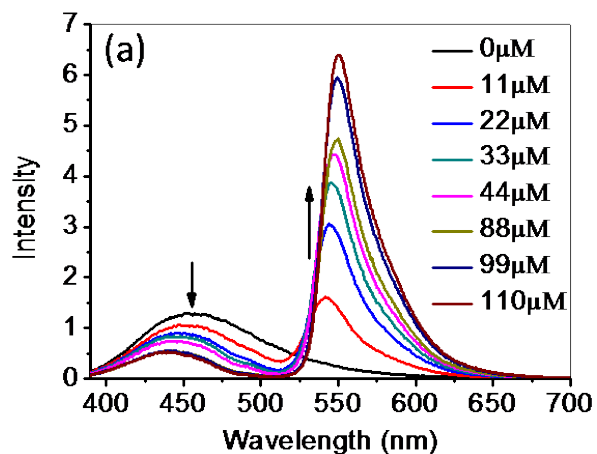
S5:

(a): Steady state fluorescence emission spectra of bmim[FAP] in presence of different concentrations of Rhodamine 6G [$\lambda_{\text{ex}}=377\text{nm}$]

(b): Stern-Volmer plot of bmim[FAP] in presence of different concentrations of Rhodamine 6G [$\lambda_{\text{ex}}=377\text{nm}$]

(c): Steady state fluorescence emission spectra of bmim[FAP] in presence of different concentrations of Rhodamine 6G [$\lambda_{\text{ex}}=402\text{nm}$]

(d): Stern-Volmer plot of bmim[FAP] in presence of different concentrations of Rhodamine 6G [$\lambda_{\text{ex}}=402\text{nm}$]



S6:

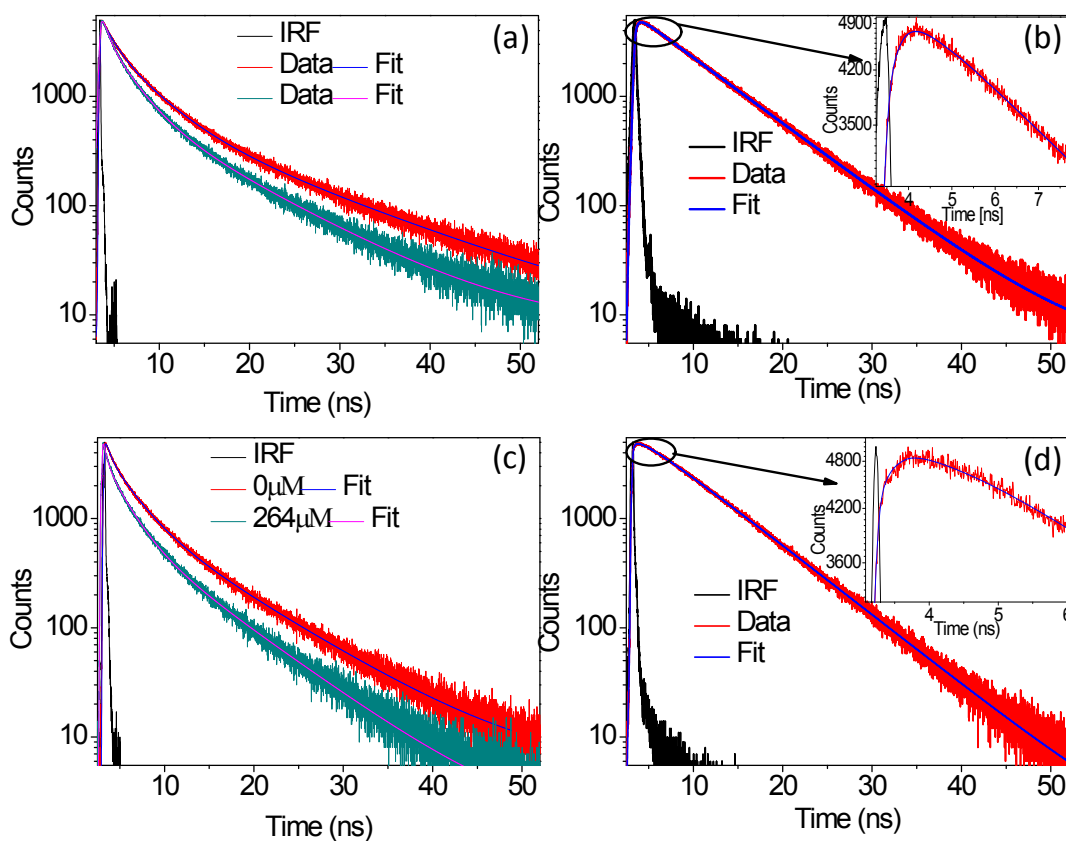
(a): Fluorescence decay curves of bmim[FAP] in absence (red) and in presence of Rhodamine 6G

(conc.=110 μ M, green) [λ_{ex} =377nm, λ_{em} =450nm]

(b): Fluorescence decay curve of Rhodamine 6G (conc.=110 μ M) in bmim[FAP] [λ_{ex} =377nm, λ_{em} =560nm]

(c): Fluorescence decay curves of bmim[FAP] in absence (red) and in presence of Rhodamine 6G (conc.=110 μ M, green) [λ_{ex} =402nm, λ_{em} =450nm]

(d): Fluorescence decay curve of Rhodamine 6G (conc.=110 μ M) in bmim[FAP] [λ_{ex} =402nm, λ_{em} =560nm]



S7:

(a): Time constants of fluorescence decay of bmim[FAP] in presence of different concentrations of Rhodamine 6G

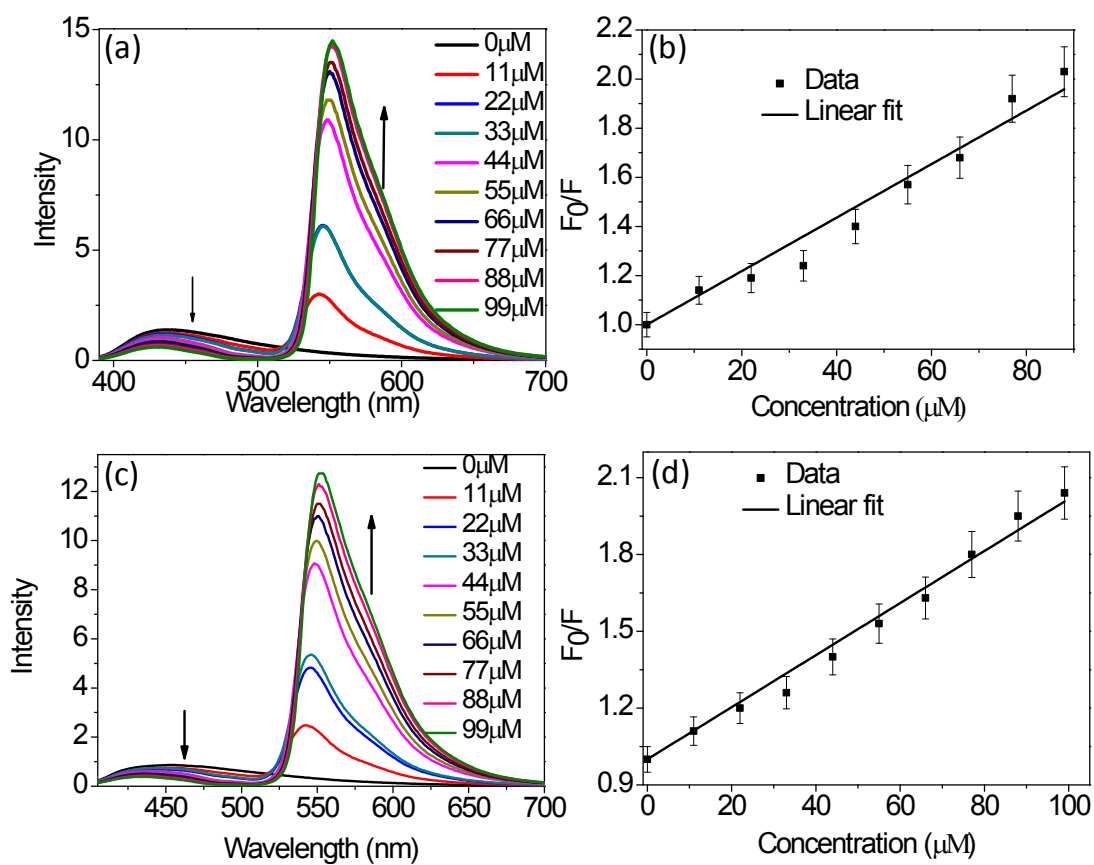
λ_{ex} (nm)	λ_{em} (nm)	Conc. (μM)	τ_1 (ns)	B ₁	τ_2 (ns)	B ₂	τ_3 (ns)	B ₃	$\langle\tau\rangle$ (ns)	χ^2
377	450	0	1.37	11.75	4.54	46.25	15.14	42.00	8.61	1.06
		110	1.18	8.80	3.44	38.85	11.97	52.35	7.70	1.02
		176	0.73	8.61	2.87	43.12	10.07	48.27	6.16	1.06
		220	0.72	9.06	2.73	42.73	9.69	48.22	5.90	1.07
		264	0.54	9.16	2.64	45.07	9.46	45.77	5.56	1.11
402	450	0	0.43	8.13	2.16	27.73	10.36	64.13	7.30	1.06
		110	0.55	3.29	2.69	38.18	8.65	58.53	6.10	1.06
		176	0.43	6.30	2.54	42.32	8.00	51.38	5.21	1.10
		220	0.36	6.58	2.36	43.38	7.77	50.03	4.93	1.15
		264	0.31	6.32	2.16	43.61	7.89	48.89	4.56	1.16

(b): Time constants of fluorescence decay of Rhodamine 6G (different concentrations) in bmim[FAP]

λ_{ex} (nm)	λ_{em} (nm)	Conc. (μM)	τ_1 (ns)	B ₁	τ_2 (ns)	B ₂	χ^2
377	550	110	3.32	-5.67	6.22	105.67	1.26
		176	3.34	-8.60	6.45	108.60	1.26
		220	3.40	-9.31	6.48	109.31	1.31
		264	3.28	-5.57	6.74	105.57	1.11
402	550	110	3.30	-12.94	6.11	112.94	1.20
		176	3.26	-13.19	6.40	113.19	1.25
		220	3.24	-12.23	6.49	112.23	1.15
		264	3.35	-18.40	6.61	118.40	1.14

S8:

- (a): Steady state fluorescence emission spectra of hmim[FAP] in presence of different concentrations of Rhodamine 6G [$\lambda_{ex}=377\text{nm}$]
- (b): Stern-Volmer plot of hmim[FAP] in presence of different concentrations of Rhodamine 6G [$\lambda_{ex}=377\text{nm}$]
- (c): Steady state fluorescence emission spectra of hmim[FAP] in presence of different concentrations of Rhodamine 6G [$\lambda_{ex}=402\text{nm}$]
- (d): Stern-Volmer plot of hmim[FAP] in presence of different concentrations of Rhodamine 6G [$\lambda_{ex}=402\text{nm}$]



S9:

(a): Fluorescence decay curves of hmim[FAP] in absence (red) and in presence of Rhodamine 6G

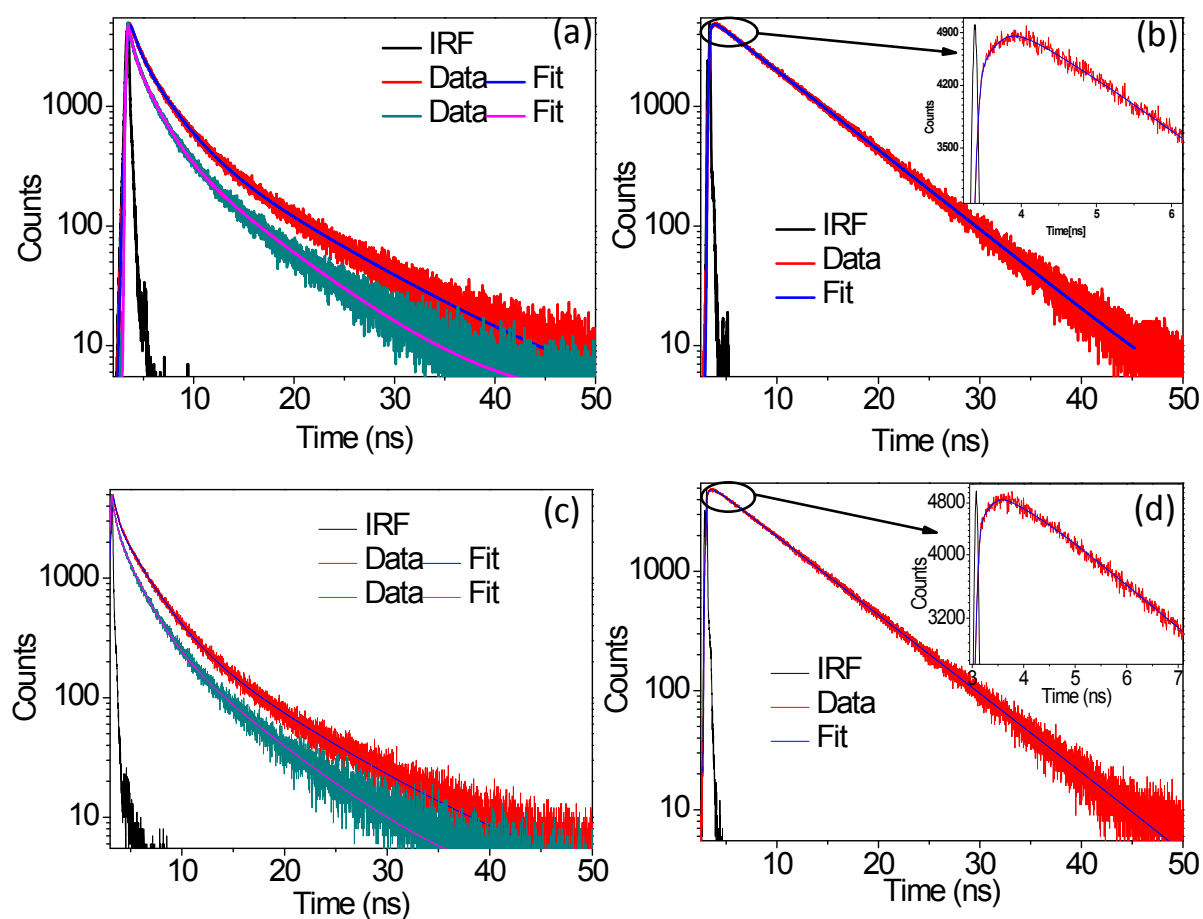
(conc.=99 μ M, green) [λ_{ex} =377nm, λ_{em} =450nm]

(b): Fluorescence decay curve of Rhodamine 6G (conc.=99 μ M) in hmim[FAP] [λ_{ex} =377nm, λ_{em} =550nm]

(c): Fluorescence decay curves of hmim[FAP] in absence (red) and in presence of Rhodamine 6G

(conc.=99 μ M, green) [λ_{ex} =402nm, λ_{em} =470nm]

(d): Fluorescence decay curve of Rhodamine 6G (conc.=99 μ M) in hmim[FAP] [λ_{ex} =402nm, λ_{em} =550nm]



S10:

Table 1: (a): Time constants of fluorescence decay of hmim[FAP] in presence of different concentrations of Rhodamine 6G

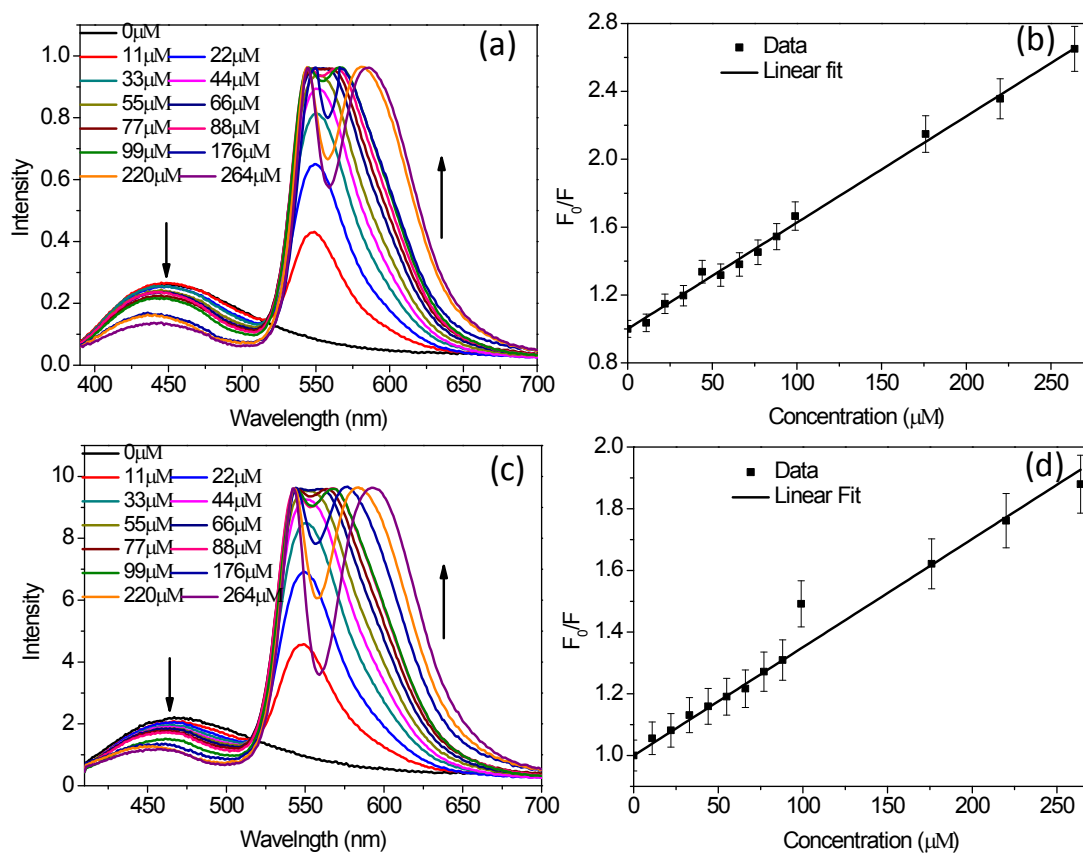
λ_{ex} (nm)	λ_{em} (nm)	Conc. (μM)	τ_1 (ns)	B_1	τ_2 (ns)	B_2	τ_3 (ns)	B_3	$\langle\tau\rangle$ (ns)	χ^2
377	450	0	0.26	11.56	2.63	50.12	8.95	38.33	4.82	1.03
		99	0.31	7.95	2.1	48.96	7.70	43.09	4.37	1.27
		176	0.34	8.16	1.99	45.79	7.12	46.05	4.21	1.19
		220	0.30	7.39	2.03	49.00	7.39	42.64	4.16	1.15
		264	0.34	9.99	1.89	49.14	6.76	40.87	3.72	1.17
402	450	0	0.30	10.09	2.47	55.49	8.27	34.42	4.02	1.11
		99	0.17	8.35	1.97	47.59	6.42	44.06	3.78	1.16
		176	0.23	10.15	1.80	48.25	6.00	41.61	3.38	1.22
		220	0.25	13.22	1.90	52.10	6.44	34.68	3.25	1.25
		264	0.23	13.88	1.57	47.56	5.35	38.56	2.84	1.15

Table 2: Time constants of fluorescence decay of Rhodamine 6G (different concentrations) in hmim[FAP]

λ_{ex} (nm)	λ_{em} (nm)	Conc. (μM)	τ_1 (ns)	B_1	τ_2 (ns)	B_2	χ^2
377	550	99	3.05	-4.39	5.84	104.39	1.21
		176	3.21	-6.60	6.08	106.60	1.14
		220	3.18	-3.18	6.13	103.18	1.18
		264	3.28	-4.48	6.41	104.48	1.19
402	550	99	3.03	-3.43	5.80	103.43	1.25
		176	3.21	-6.60	6.08	106.60	1.14
		220	3.26	-12.07	6.22	112.07	1.16
		264	3.26	-6.96	6.41	106.96	1.24

S11:

- (a): Steady state fluorescence emission spectra of hmim[PF₆] in presence of different concentrations of Rhodamine 6G [$\lambda_{\text{ex}}=377\text{nm}$]
- (b): Stern-Volmer plot of hmim[PF₆] in presence of different concentrations of Rhodamine 6G [$\lambda_{\text{ex}}=377\text{nm}$]
- (c): Steady state fluorescence emission spectra of hmim[PF₆] in presence of different concentrations of Rhodamine 6G [$\lambda_{\text{ex}}=402\text{nm}$]
- (d): Stern-Volmer plot of hmim[PF₆] in presence of different concentrations of Rhodamine 6G [$\lambda_{\text{ex}}=402\text{nm}$]



S12:

(a): Fluorescence decay curves of hmim[PF₆] in absence (red) and in presence of Rhodamine 6G

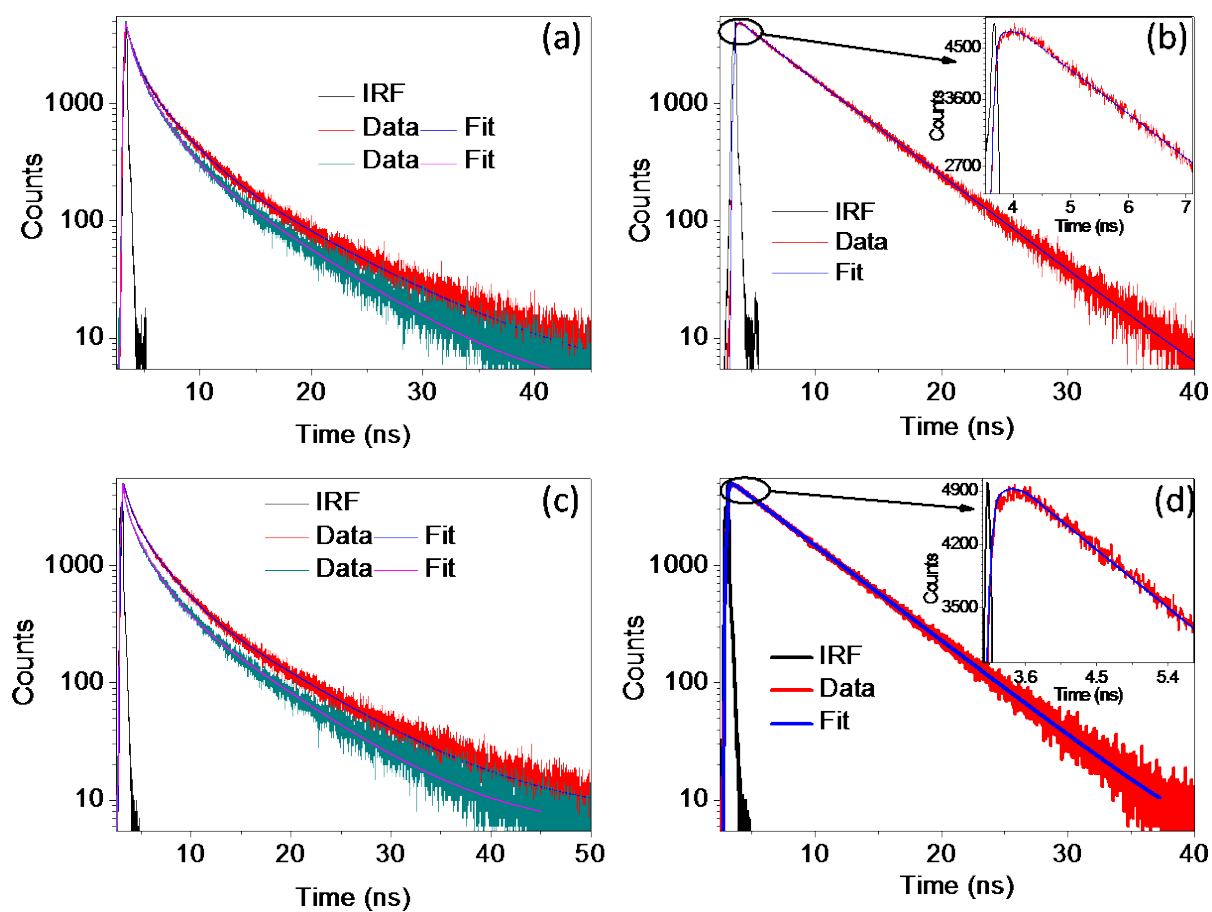
(conc.=264μM, green) [λ_{ex} =377nm, λ_{em} =450nm]

(b): Fluorescence decay curve of Rhodamine 6G (conc.=264μM) in hmim[PF₆] [λ_{ex} =377nm, λ_{em} =560nm]

(c): Fluorescence decay curves of hmim[PF₆] in absence (red) and in presence of Rhodamine 6G

(conc.=264μM, green) [λ_{ex} =402nm, λ_{em} =470nm]

(d): Fluorescence decay curve of Rhodamine 6G (conc.=264μM) in hmim[PF₆] [λ_{ex} =402nm, λ_{em} =560nm]



S13:

(a): Time constants of fluorescence decay of hmim[PF₆] in presence of different concentrations of Rhodamine 6G

λ_{ex} (nm)	λ_{em} (nm)	Conc. (μM)	τ_1 (ns)	B ₁	τ_2 (ns)	B ₂	τ_3 (ns)	B ₃	$\langle\tau\rangle$ (ns)	χ^2
377	450	0	0.40	10.42	2.27	42.68	8.46	46.90	4.97	1.19
		99	0.48	13.04	2.25	47.49	7.83	39.47	4.22	1.22
		176	0.30	15.63	2.20	45.56	7.52	38.81	3.99	1.18
		220	0.38	11.82	2.00	47.57	6.87	40.62	3.78	1.20
		264	0.39	12.62	1.92	47.57	6.88	39.81	3.70	1.17
402	470	0	0.36	8.04	2.14	44.66	8.34	47.30	5.03	1.14
		99	0.28	8.33	2.16	42.72	8.00	48.95	4.86	1.25
		176	0.22	7.75	1.96	41.34	7.47	50.91	4.63	1.19
		220	0.18	9.12	1.90	42.33	7.26	48.55	4.34	1.23
		264	0.23	10.13	1.82	43.27	6.98	46.60	4.06	1.24

(b): Time constants of fluorescence decay of Rhodamine 6G (different concentrations) in hmim[PF₆]

λ_{ex} (nm)	λ_{em} (nm)	Conc. (μM)	τ_1 (ns)	B ₁	τ_2 (ns)	B ₂	χ^2
377	550	99	2.71	-1.23	5.13	101.23	1.24
		176	2.64	-0.49	5.19	100.49	1.09
		220	2.69	-1.23	5.32	101.23	1.28
		264	2.65	-2.01	5.26	102.26	1.20
402	550	99	2.59	-2.60	5.03	102.60	1.28
		176	2.71	-1.23	5.13	101.23	1.24
		220	2.65	-2.30	5.29	102.30	1.19
		264	2.71	-2.81	5.48	102.81	1.22

S14:

- (a): Steady state fluorescence spectra of hmim[BF₄] in presence of different concentrations of Rhodamine 6G [$\lambda_{\text{ex}}=402\text{nm}$]
- (b): Stern-Volmer plot of hmim[BF₄] in presence of different concentrations of Rhodamine 6G [$\lambda_{\text{ex}}=402\text{nm}$]
- (c): Fluorescence decay curves of hmim[BF₄] in absence (red) and in presence of Rhodamine 6G (conc.=176 μM , green) [$\lambda_{\text{ex}}=402\text{nm}$, $\lambda_{\text{em}}=470\text{nm}$]
- (d): Fluorescence decay curve of Rhodamine 6G (conc.=176 μM) in hmim[BF₄] [$\lambda_{\text{ex}}=402\text{nm}$, $\lambda_{\text{em}}=560\text{nm}$]

