

Aggregation Assisted Turn-On Response of ANS Dye towards Protamine

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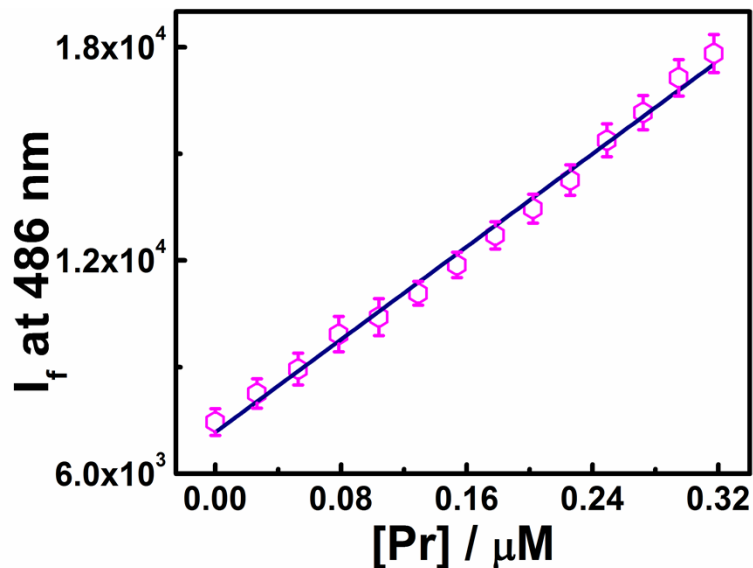


Figure S1. Linear fit of intensity change of ANS against Pr concentration in the dynamic range of 0 to 0.32 μM for LOD determination. ($I_{486} = 32.64 \times 10^3 [\text{Pr}/\mu\text{M}] + 7165.4$; $R^2 = 0.993$, LOD ~ 4.05 nM, standard dev = 44.1, obtained from 10 successive measurements of free ANS in water).

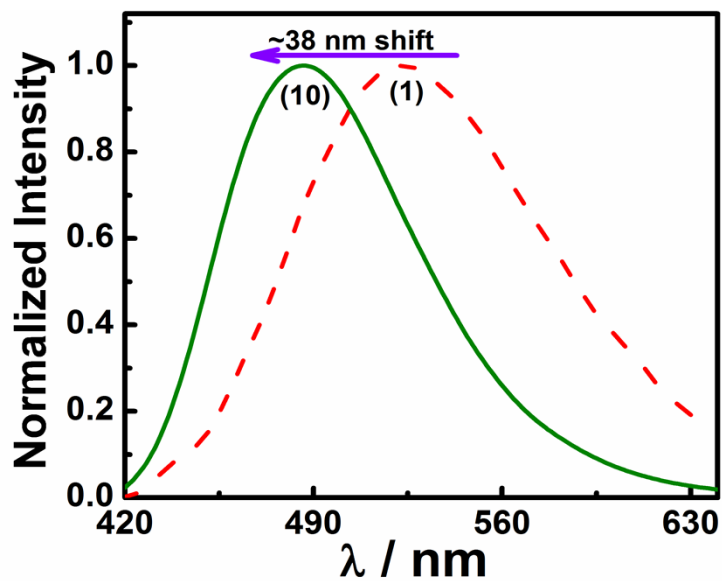


Figure S2. Normalized emission spectra of 180 μM ANS at (1) 0 and (10) 3.67 μM of Pr.

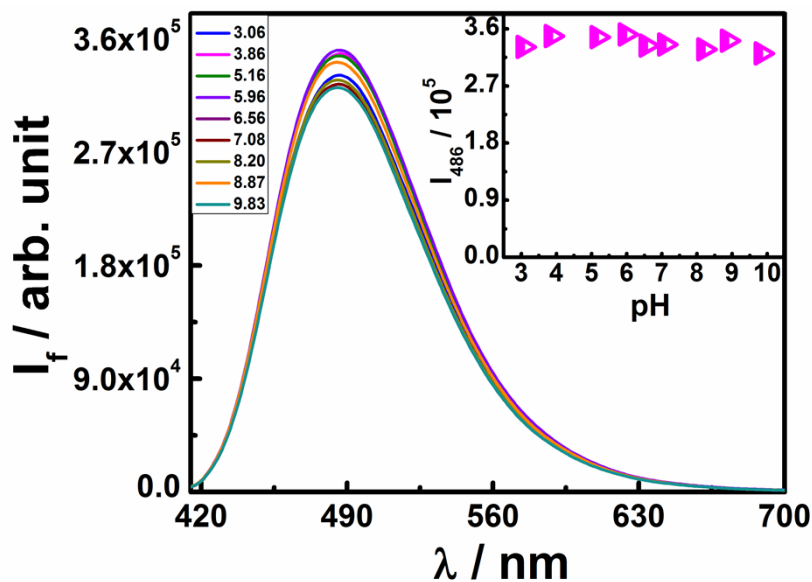


Figure S3. Emission spectra of ANS-Pr complex (180 μM ANS + 3.5 μM Pr) with change in pH of the medium from 3.06 to 9.83. Inset: Variation of emission intensity of ANS-Pr complex at 486 nm with pH of the medium.

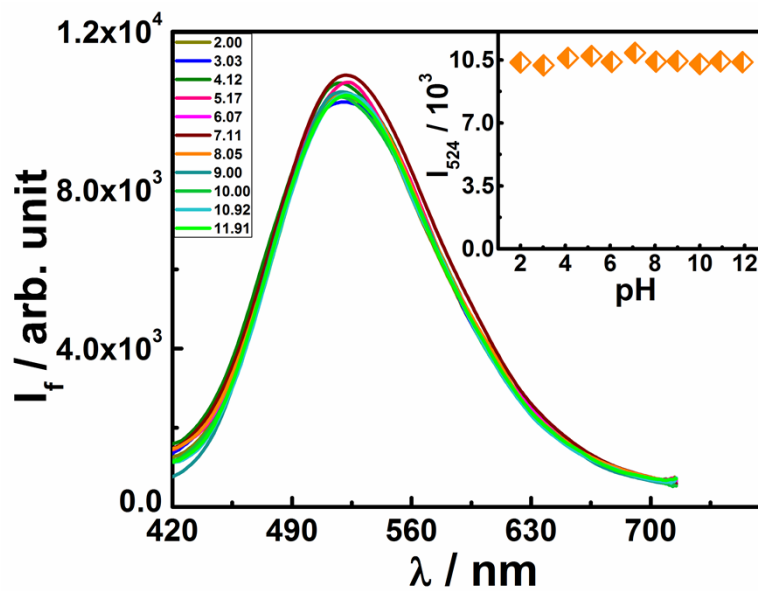


Figure S4. Emission spectra of ANS (180 μM) with change in pH of the medium from 2.00 to 11.91. Inset: Variation of emission intensity of ANS complex at 524 nm with pH of the medium.

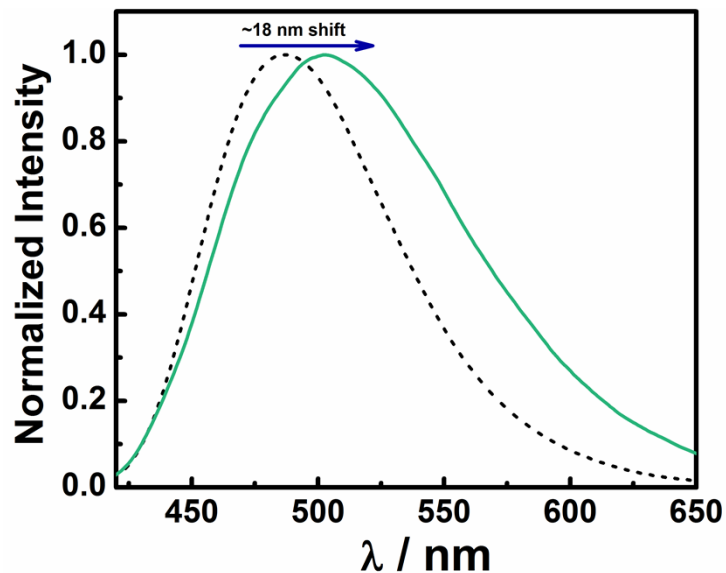


Figure S5. Peak normalized emission spectra of ANS-Pr complex (180 μ M ANS+3.5 μ M Pr) at 0 (black dashed) and 46.94 mM (light green) NaCl.

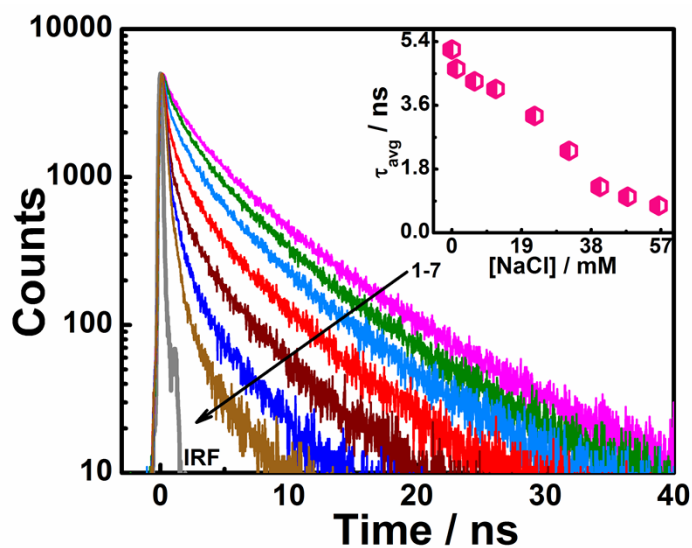


Figure S6. Excited-state decay traces of ANS-Pr complex (180 μ M ANS+3.5 μ M Pr) with increase in NaCl concentration (in mM): (1) 0, (2) 3.14, (3) 11.98, (4) 22.54, (5) 31.93, (6) 40.34 and (7) 56.35. Inset: Decrease in mean fluorescence lifetime of ANS-Pr complex as a function increasing NaCl concentration. $\lambda_{\text{ex}} = 405$ nm, $\lambda_{\text{em}} = 486$ nm.

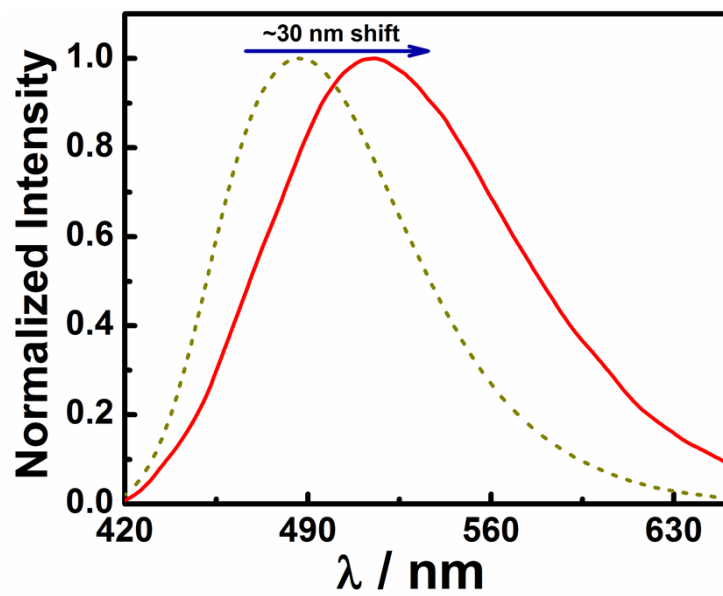


Figure S7. Peak normalized emission spectra of ANS-Pr complex (180 μ M ANS+3.5 μ M Pr) at 20 °C (dark yellow dashed) and 70 °C (red).

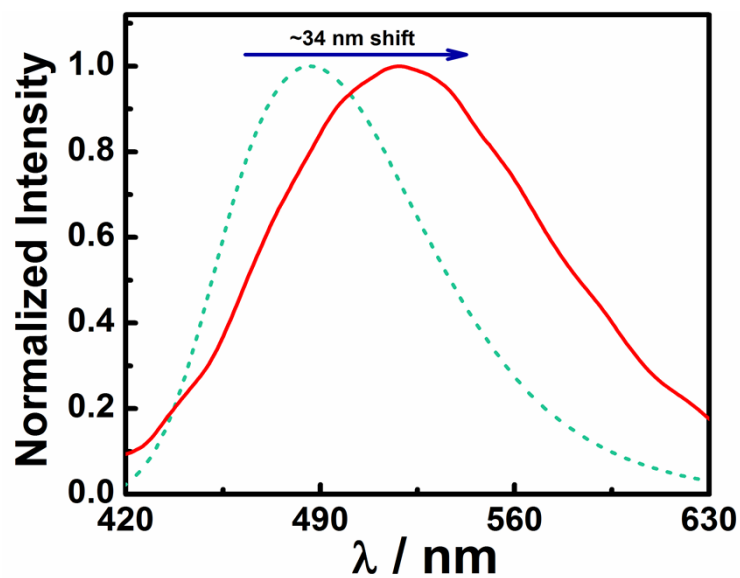


Figure S8. Peak normalized emission spectra of ANS-Pr complex (180 μ M ANS+3.5 μ M Pr) at 0 (light green dashed) and 3.41 μ M (red) Hp.

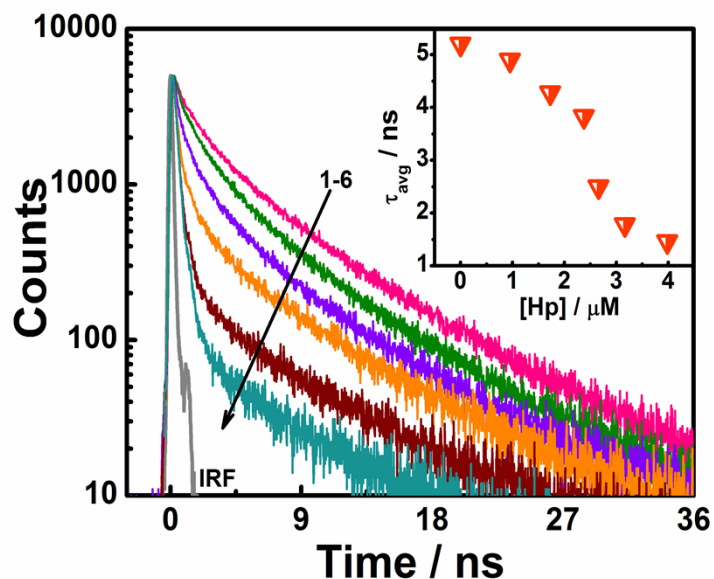


Figure S9. Excited-state decay traces of ANS-Pr complex (180 μM ANS+3.5 μM Pr) with increase in heparin (Hp) concentration (in μM): (1) 0, (2) 1.72, (3) 2.38, (4) 2.66, (5) 2.92 and (6) 3.98. Inset: Reduction of mean fluorescence lifetime of ANS-Pr complex as a function of Hp concentration. $\lambda_{\text{ex}} = 405$ nm, $\lambda_{\text{em}} = 486$ nm.

Table S1. Fluorescence decay parameters for ANS-Pr complex (180 μM ANS+3.5 μM Pr) in water at different concentrations of NaCl.

Conc. of NaCl (μM)	τ_1 (ns)	A_1 (%)	τ_2 (ns)	A_2 (%)	τ_3 (ns)	A_3 (%)	τ_{avg} (ns)
0	0.46	6.5	2.46	32.3	7.12	61.2	5.18
0.53	0.45	6.4	2.29	30.8	6.97	62.8	5.11
1.27	0.44	7.6	2.25	35.2	6.66	57.2	4.63
3.14	0.41	7.8	2.12	35.0	6.60	57.2	4.55
6.18	0.36	9.8	1.98	34.5	6.40	55.7	4.28
11.98	0.34	13.0	1.96	33.7	6.30	53.3	4.06
22.54	0.29	24.8	1.93	33.5	6.20	41.7	3.30
31.93	0.27	41.3	1.65	26.8	5.54	31.9	2.32

40.34	0.26	60.1	1.26	19.6	4.45	20.3	1.30
47.90	0.26	70.3	1.46	17.0	4.66	12.7	1.02
56.35	0.26	79.0	1.35	12.2	4.57	8.8	0.77

Table S2. Fluorescence decay parameters for ANS-Pr complex (180 μM ANS+ 3.5 μM Pr) in water at different concentrations of Heparin (Hp).

Conc. of Hp (μM)	τ_1 (ns)	A₁ (%)	τ_2 (ns)	A₂ (%)	τ_3 (ns)	A₃ (%)	τ_{avg}(ns)
0	0.37	6.6	2.18	30.9	7.20	62.5	5.20
0.95	0.35	7.2	2.15	34.9	7.14	57.9	4.90
1.36	0.34	9.3	2.10	38.3	7.14	52.4	4.57
1.73	0.34	13.1	2.05	38.4	7.14	48.5	4.28
2.07	0.32	19.4	2.03	33.0	7.12	47.6	4.12
2.38	0.26	33.6	1.90	18.6	7.10	47.8	3.83
2.66	0.24	61.1	1.50	6.7	7.00	32.2	2.50
2.93	0.24	69.4	1.40	5.8	7.00	24.8	1.98
3.17	0.24	72.8	1.30	4.8	6.90	22.4	1.78
3.98	0.24	76.2	1.00	6.0	6.85	17.8	1.46