Single Fluorophore to Address Multiple Logic Gates

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Supplemetary information

$$A = A_0 + \frac{(A_f - A_0)}{2C_h}[\, C_h + C_g + \frac{1}{K_a} - [(C_h + C_g + \frac{1}{K_a})^2 - 4C_hC_g]^{\frac{1}{2}}] \quad \text{.....} \quad \text{(S1)}[1]$$

Where A_0, A_f and A refer the absorbances of only DMAPIP-b, only Fe^{3+}-DMAPIP-b complex and any intermediate Fe^{3+} concentration with DMAPIP-b. K_a refers the Fe^{3+} binding constant of DMAPIP-b. C_h and C_g indicate the concentration of DMAPIP-b and Fe^{3+} repectively.

The self-absorption effect is corrected using the following equation and the corrected emission value ($I_{corrected}$) has been used for quantum yield calculation.[2]
$I_{corrected} = I_{observed}$ x 10^(($A_{exc} + A_{em}$)/2)

Membership Functions
A zmf can be represented as

$$f(x;a,b) = \begin{cases} 1, x \le a \\ 1 - 2\left(\frac{x-a}{b-a}\right)^2, a \le x \le \frac{a+b}{2} \\ 2\left(\frac{x-b}{b-a}\right)^2, \frac{a+b}{2} \le x \le b \\ 0, x \ge b \end{cases}$$

A trimf can be represented as follow.

$$f(x;a,b,c) = \begin{cases} 0, x \le a \\ \frac{x-a}{b-a}, a \le x \le b \\ \frac{c-x}{c-b}, b \le x \le c \\ 0, x \ge c \end{cases}$$

A smf can be represented as follow.

$$f(x;a,b) = \begin{cases} 0, x \le a \\ 2\left(\frac{x-a}{b-a}\right)^2, a \le x \le \frac{a+b}{2} \\ 1 - 2\left(\frac{x-b}{b-a}\right)^2, \frac{a+b}{2} \le x \le b \\ 1, x \ge b \end{cases}$$

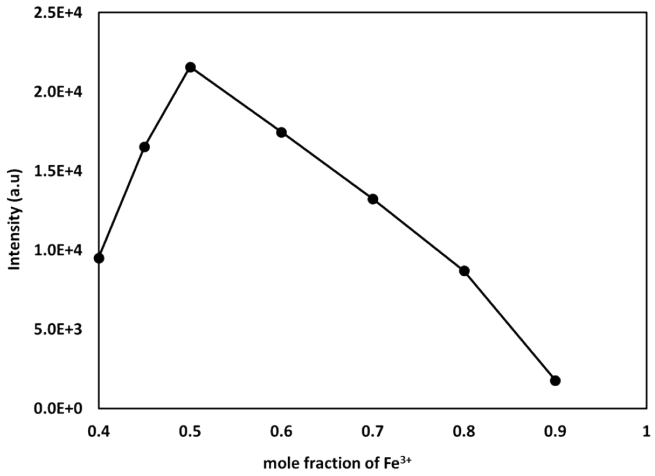

Fig. S1. Job's plot for Fe^{3+}-DMAPIP-b complex (Emission monitored at 432 nm, due to the interfering of the DMAPIP-b emission at low mole fraction of [Fe^{3+}], those points are not included in the plot).

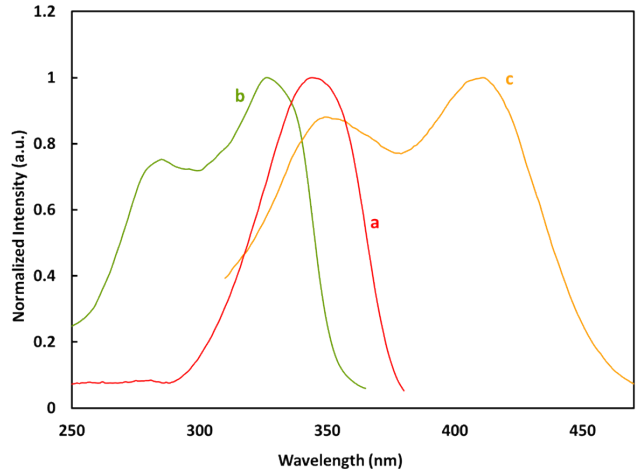

Fig. S2. Normalized excitation spectra of (a) DMAPIP-b, λ_{em}= 406 nm and DMAPIP-b with 20 μM of Fe^{3+}, (b) λ_{em} = 380 nm, (c) λ_{em} = 560 nm.

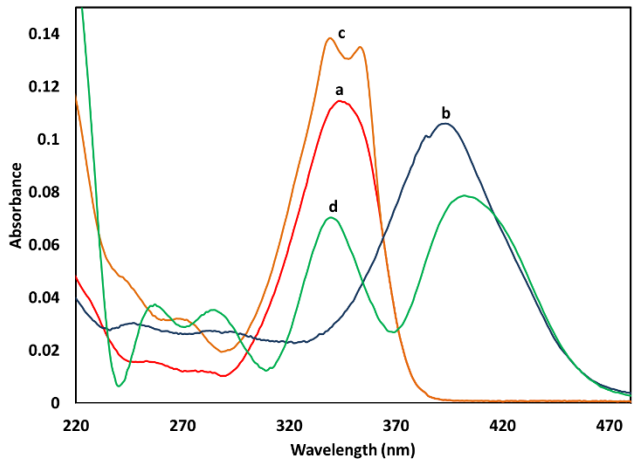

Fig. S3. Absorption spectra of (a) DMAPIP-b, (b) DMAPIP-b with 200 μM of Fe^{3+}, (c) DMAPIP-b with 200 μM of F^-, (d) DMAPIP-b with 200 μM of Fe^{3+} and F^-.

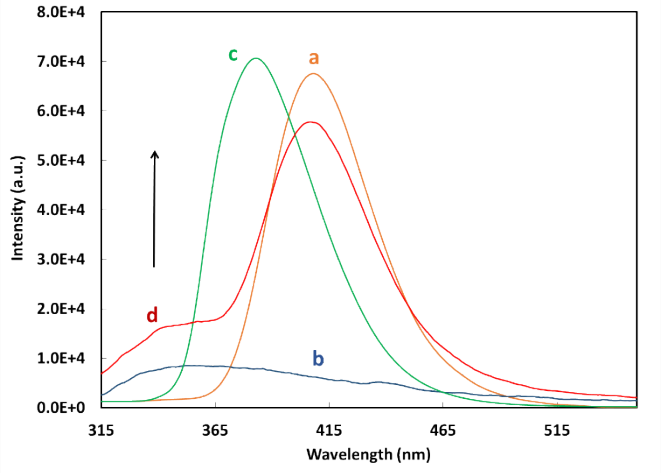

Fig. S4. Emission spectra of (a) DMAPIP-b, (b) DMAPIP-b with 200 μM of Fe^{3+}, (c) DMAPIP-b with 200 μM of F^-, (d) DMAPIP-b with 200 μM of Fe^{3+} and F^-. λ_{exc} = 280 nm.

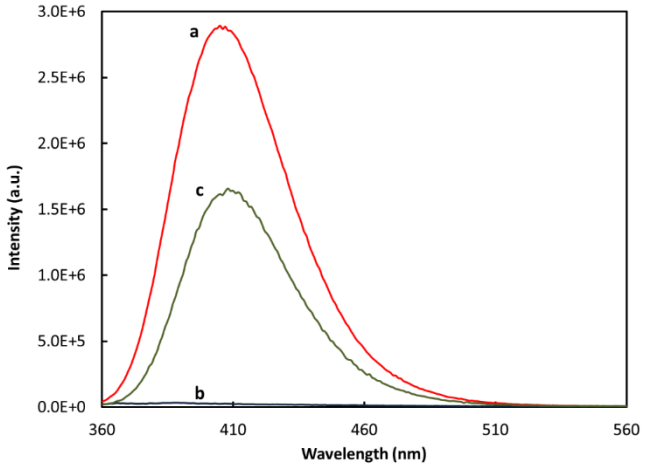

Fig. S5. Comparison of emission Spectra, (a) DMAPIP-b, (b) DMAPIP-b with 200 µM of Fe^{3+}, (c) DMAPIP-b with 200 µM of Fe^{3+} and 200 µM of F^-. λ_{exc} = 345 nm.

References

1. J. Bourson , J. Pouget , B. Valeur, *J. Phys. Chem.*, 1993, **97**, 4552–4557.

2. M. Van de Weet, *J. Fluoresc.* 2010, **20**, 625-629.