Electronic Supplementary Material (ESI) for Dalton Transactions


# A differential ICT based molecular probe for multi-ions and multifunction logic circuits

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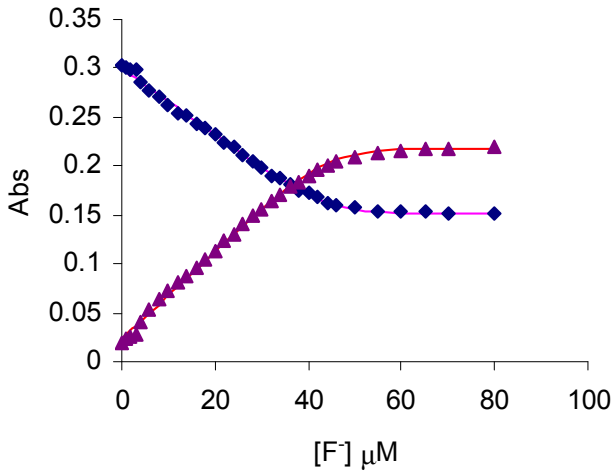



**Fig. S1**: The spectral fitting of the absorbance data on incremental addition of fluoride ions to the solution of probe **1** (20 µM, $CH_3CN$)

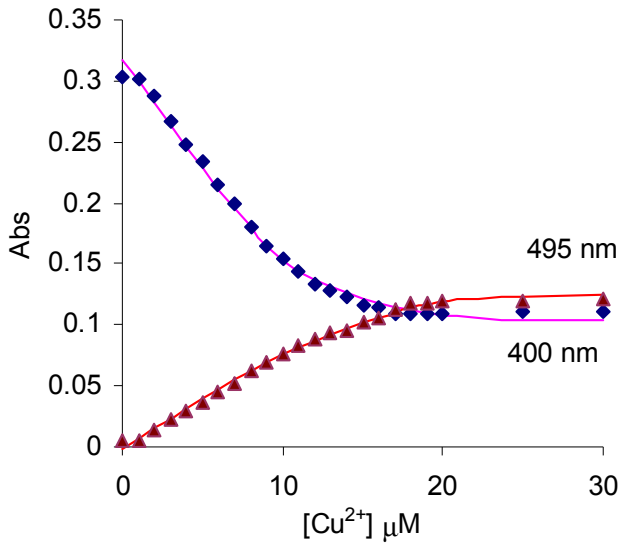



**Fig. S2**: The spectral fitting of the absorbance data on incremental addition of $Cu^{2+}$ ions to the solution of probe **1** (20 μM, $CH_3CN$)

The spectral fitting of these absorbance data shows the formation of M:L complex log $\beta_{LCu} = 6.78 \pm 0.12$.

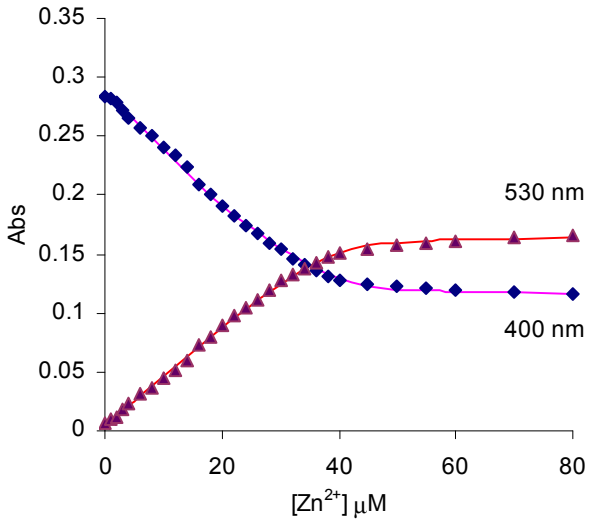



**Fig. S3**: The spectral fitting of the absorbance data on incremental addition of $Zn^{2+}$ ions to the solution of probe **1** (20 μM, $CH_3CN$)

The spectral fitting of these absorbance data shows the formation of ML complex log $\beta_{LZn} = 5.6 \pm 0.02$

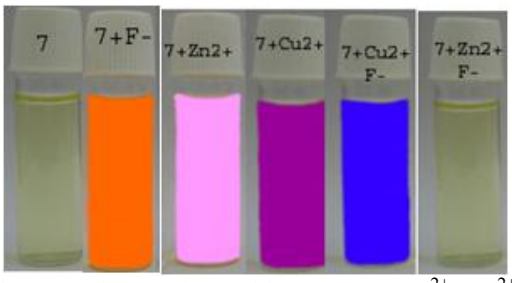



**Fig. S4**: The visible color changes observed on addition of $F^-$, $Zn^{2+}$, $Cu^{2+}$ or both $F^-$ and $Cu^{2+}$ or $F^-$ and $Zn^{2+}$ ions to the solution of **1** (20 µM, $CH_3CN$).

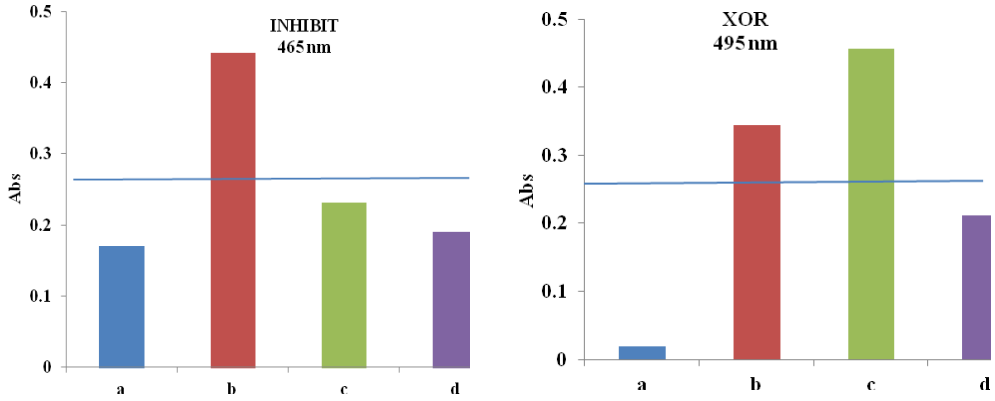



**Fig. S5**: Bar diagram of half-subtractor showing the absorption intensities with different inputs; (a) only **1**; (b) **1** + TBA F (80 µM); (c) **1** + $Cu^{2+}$ (20 µM); (d) **1** + $Cu^{2+}$ (20 µM) + TBA F (80 µM).

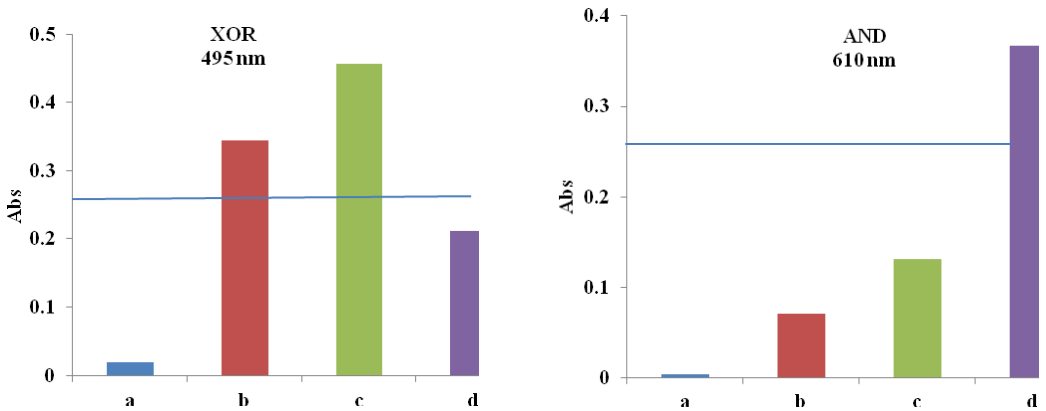



**Fig. S6:** Bar diagram of half-adder with the absorption intensities with different inputs; probe **1** (20 µM) (a) only **1**; (b) **1** + TBA F (80 µM); (c) **1** + $Cu^{2+}$ (20 µM); (d) **1** + $Cu^{2+}$ (20 µM) + TBA F (80 µM); XOR at 495 nm AND at 610 nm.

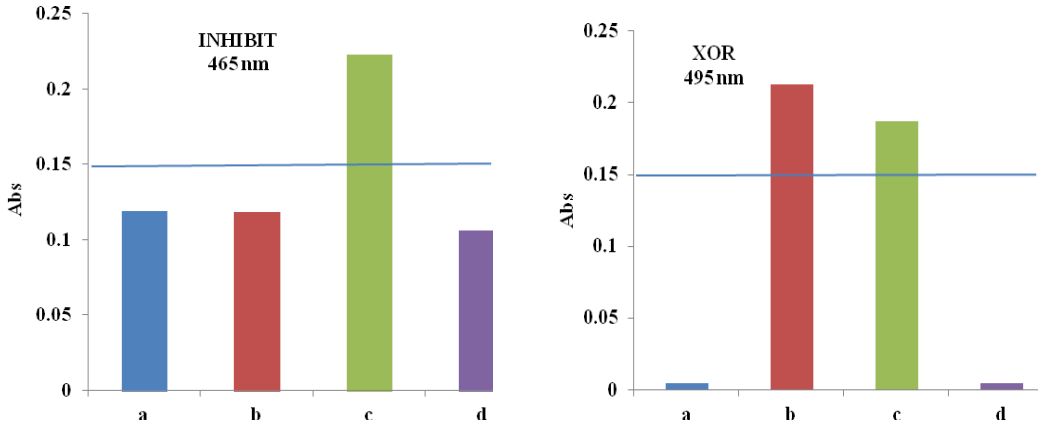



**Fig. S7:** Bar diagram of half-adder with the absorption intensities with different inputs to **1** (20 μM, $CH_3CN$). (a) only **1**; (b) **1** + TBA F (80 μM); (c) **1** + $Zn^{2+}$ (20 μM); (d) **1** + $Zn^{2+}$ (20 μM) + TBA F (80 μM). XOR at 495 nm, INHIBIT at 465 nm.

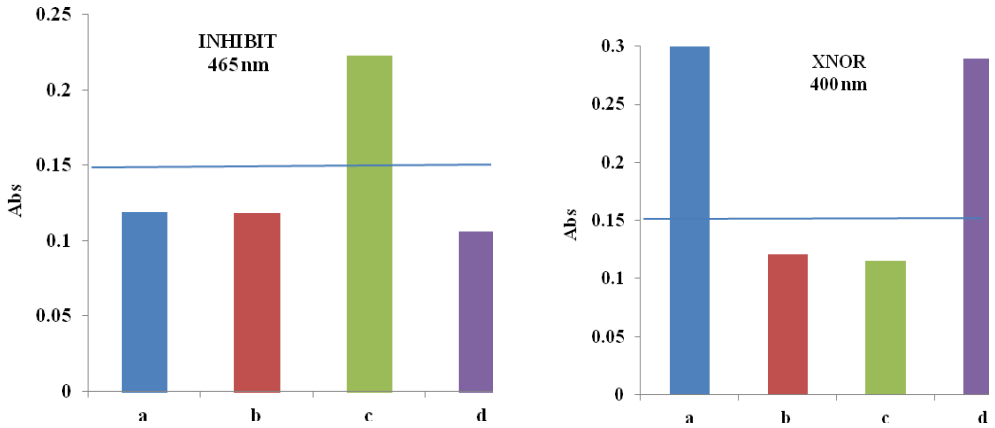
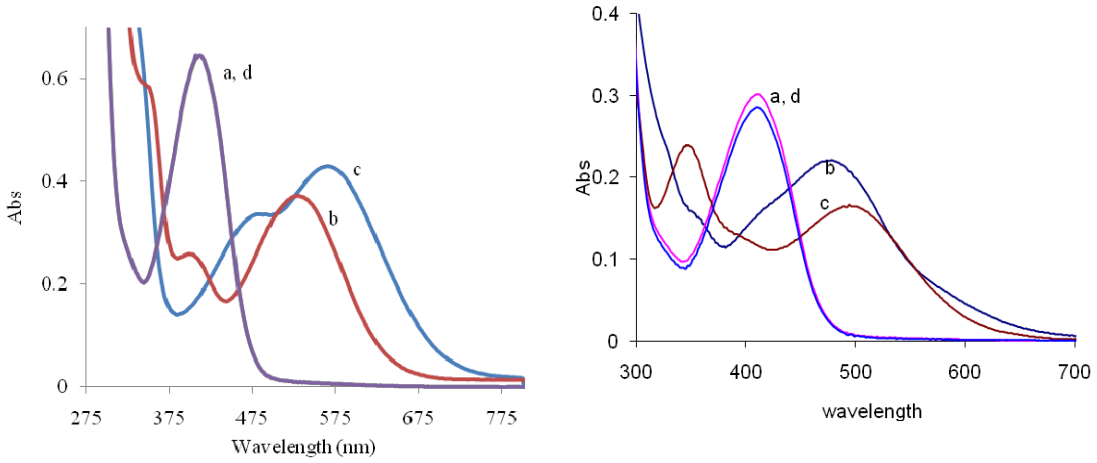



**Fig. S8:** Bar diagram of comparator logic function with the absorption intensities with different inputs to **1** (20 μM, $CH_3CN$). (a) only **1**; (b) **1** + TBA F (80 μM); (c) **1** + $Zn^{2+}$ (20 μM); (d) **1** + $Zn^{2+}$ (20 μM) + TBA F (80 μM). XNOR at 400 nm, INHIBIT at 465 nm.




A B

**Fig. S9:** (A) UV-vis spectra of probe **1** (20 µM, $CH_3CN$) (a) only **1**; (b) **1** + $Cu^{2+}$ (20 µM); (c) **1** + $Cu^{2+}$ (20 µM) + TBA F (80 µM); (d) **1** + $Cu^{2+}$ (20 µM) + TBA F (80 µM)+ EDTA (80 µM). (B) UV-vis spectra of probe **1** (20 µM, $CH_3CN$) (a) only **1**; (b) **1** + TBA F (80 µM); (c) **1** + $Zn^{2+}$ (20 µM); (d) **1** + $Zn^{2+}$ (20 µM) + TBA F (80 µM).

The addition of EDTA removes $Cu^{2+}$ due to complex formation and free $F^-$ ions due to formation of HF or NaF.