Electronic Supplementary Material (ESI) for RSC Advances

Supporting Information

A Water Soluble Fluorescent Sensor for the Reversible Detection of Tin (IV) Ion and Phosphate Anion

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Determination of quantum yields

The quantum yield of **DQS** (Φ_0) and **DQS**-Sn^{4+} (Φ_1, in the present of 5 equiv of Sn^{4+} ions) were determined according to the literature.[1]

$$\Phi_{Sample} = \frac{\Phi_{QS} \cdot A_{QS} \cdot F_{Sample} \cdot \lambda_{exQS} \cdot \eta_{Sample}^{2}}{A_{Sample} \cdot F_{QS} \cdot \lambda_{exSample} \cdot \eta_{QS}^{2}}$$

Where Φ is quantum yield; A is absorbance at the excitation wavelength; F is integrated area under the corrected emission spectra; λ_{ex} is the excitation wavelength; η is the refractive index of the solution; the Sample and QS refer to the sample and the standard, respectively. We chose quinine sulfate in 0.1N H_2SO_4 as standard, which has the quantum yield of 0.546.[2]

Other Photophysical properties of DQS

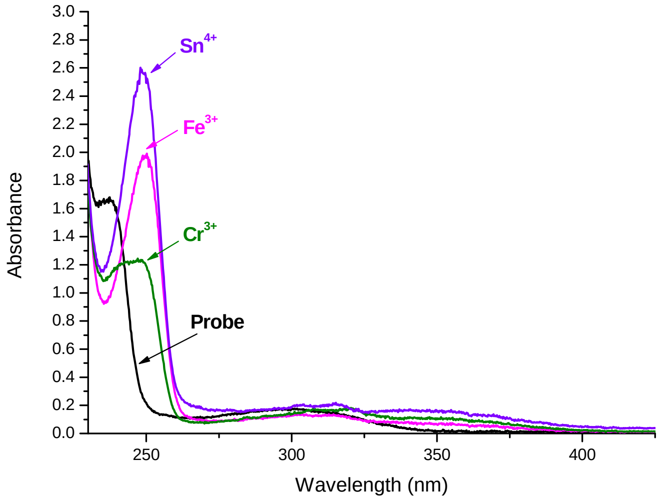


Figure S1. Absorption spectra of **DQS** (10 μM) in water solution in the present of Sn^{4+}, Fe^{3+}, and Cr^{3+} (1 equiv), respectively.

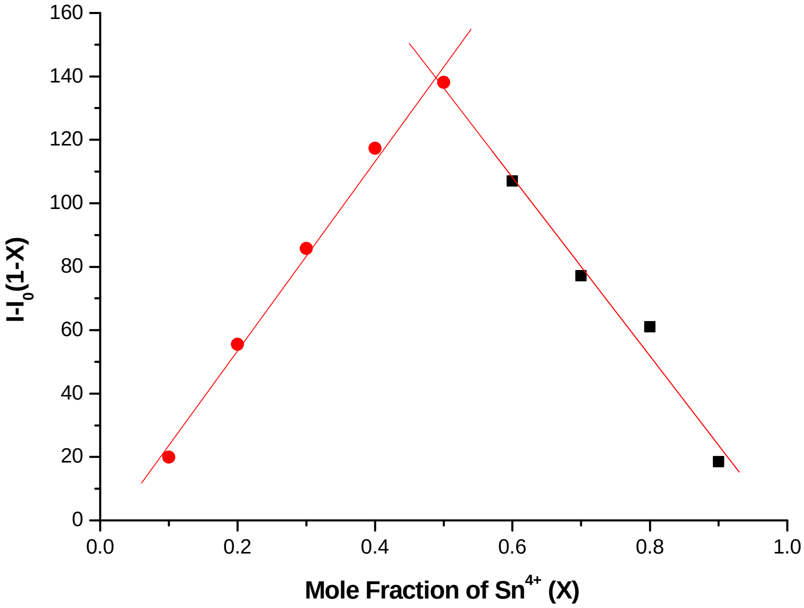


Figure S2. Job's plot of sensor **DQS**, the total concentration of the sensor and Sn^{4+} is 25.0 μM.

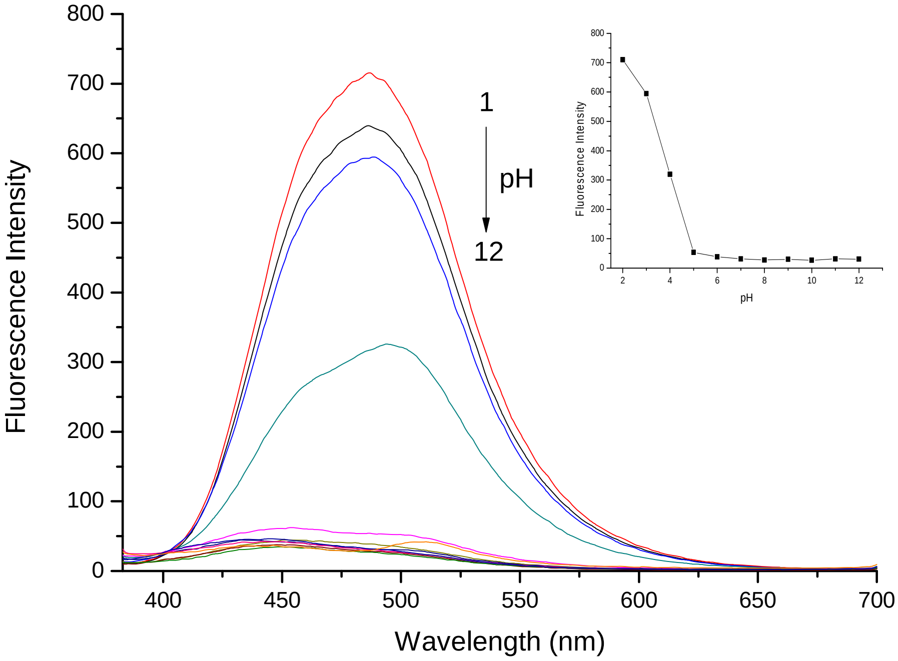


Figure S3. Effect of the pH on the fluorescence emission of **DQS** (5.0 μM).

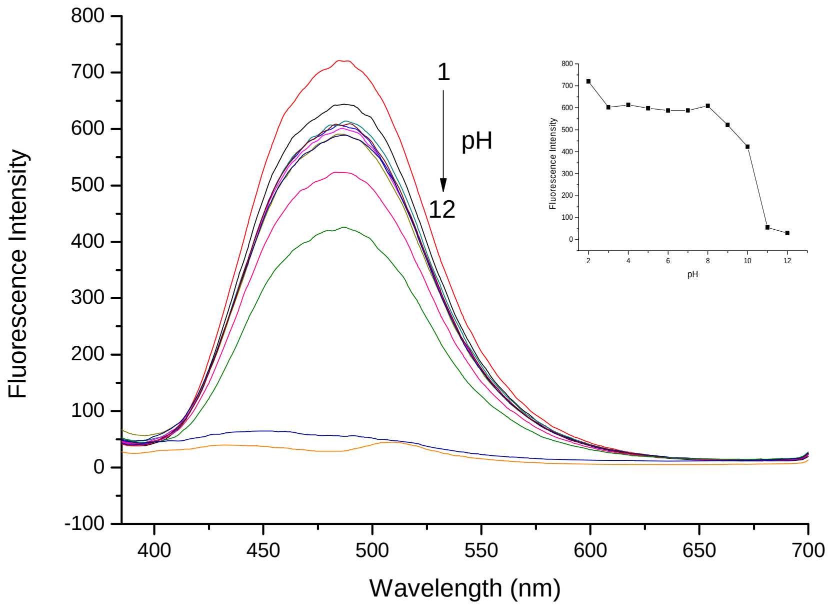


Figure S4. Effect of the pH on the fluorescence emission of **DQS**-Sn^{4+} complex (5.0 μM of **DQS** in the prescent of 20 equiv of Sn^{4+}).

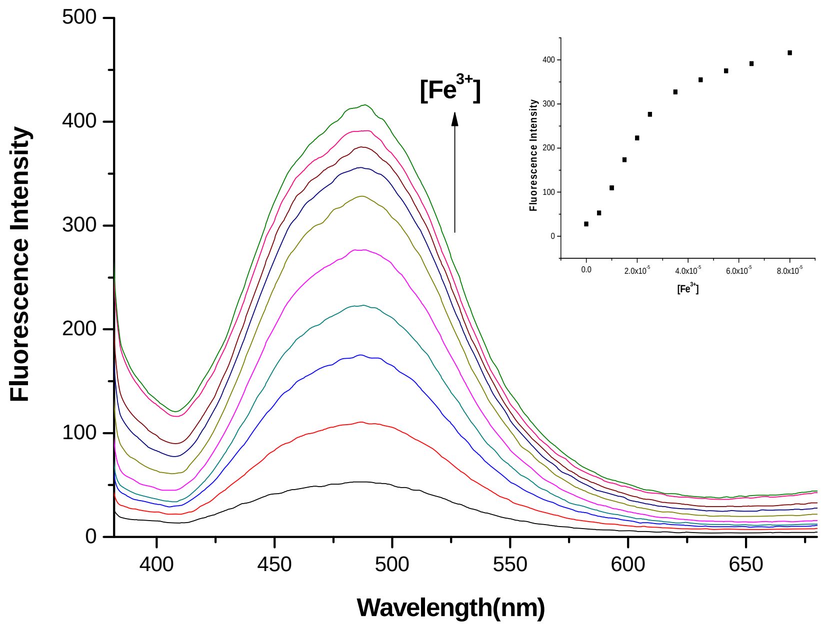


Figure S5. Fluorescence spectra of **DQS** (5 μM) in water in the presence of different concentrations of Fe^{3+} (0-90 μM) (λ_{ex} = 360 nm). Inset: fluorescence intensity changes as a function of Fe^{3+} concentration.

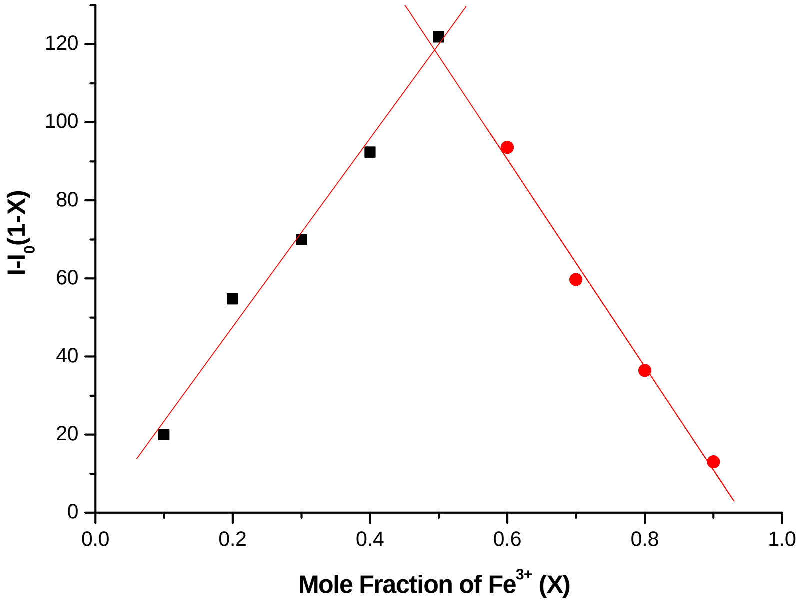


Figure S6. Job's plot of sensor **DQS**, the total concentration of the sensor and Fe^{3+} is 25.0 μM.

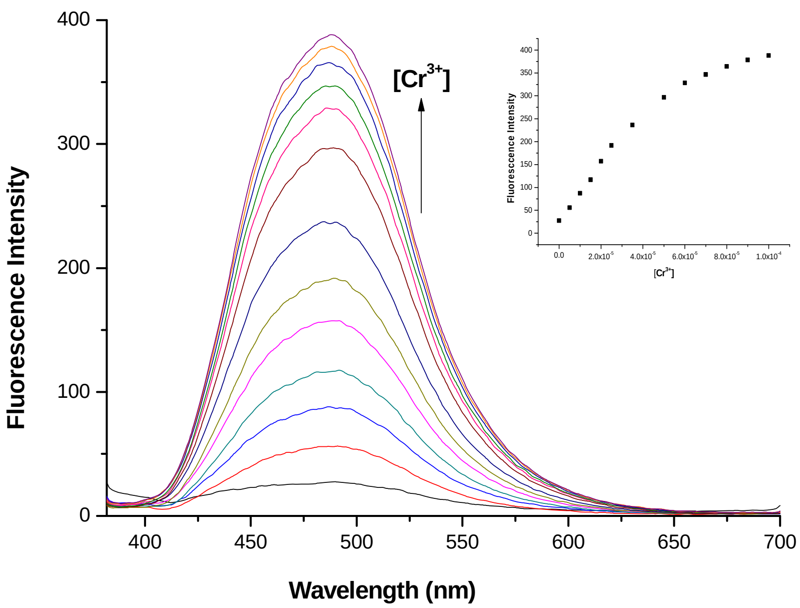


Figure S7. Fluorescence spectra of **DQS** (5 μM) in water in the presence of different concentrations of Cr^{3+} (0-100 μM) (λ_{ex} = 360 nm). Inset: fluorescence intensity changes as a function of Cr^{3+} concentration.

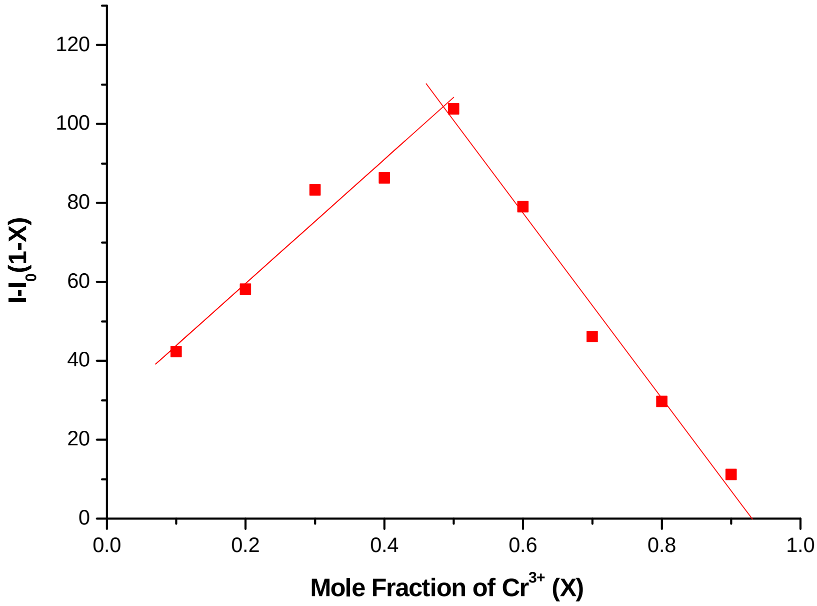


Figure S8. Job's plot of sensor **DQS**, the total concentration of the sensor and Cr^{3+} is 25.0 μM.

Determination of the binding constant

The apparent binding constant (K_S) of **DQS** with Sn^{4+} was determined using the nonlinear least-squares analysis base on a 1:1 complex expression:[3]

$$\frac{F}{F_0} = 1 + \left(\frac{F_{max}}{2F_0} - \frac{1}{2}\right)\left[1 + \frac{C_M}{C_L} + \frac{1}{K_S C_L} - \sqrt{\left(1 + \frac{C_M}{C_L} + \frac{1}{K_S C_L}\right)^2 - 4\frac{C_M}{C_L}}\right]$$

Where F_0 or F is the fluorescence emission intensities in the absence or presence of Sn^{4+} ions, C_M and C_L are the concentrations of Sn^{4+} and **DQS**, and K_S is the stability constant.

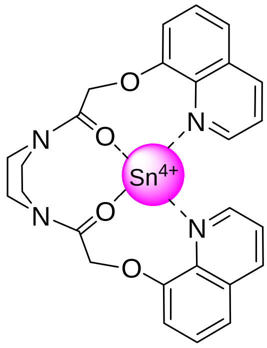
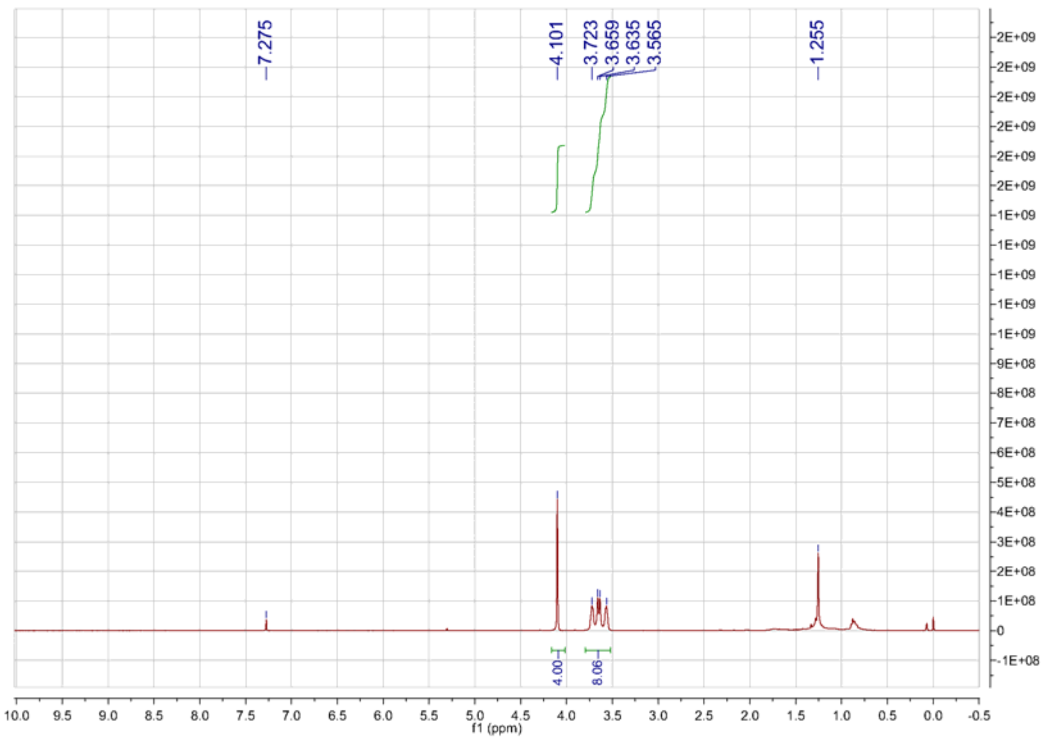


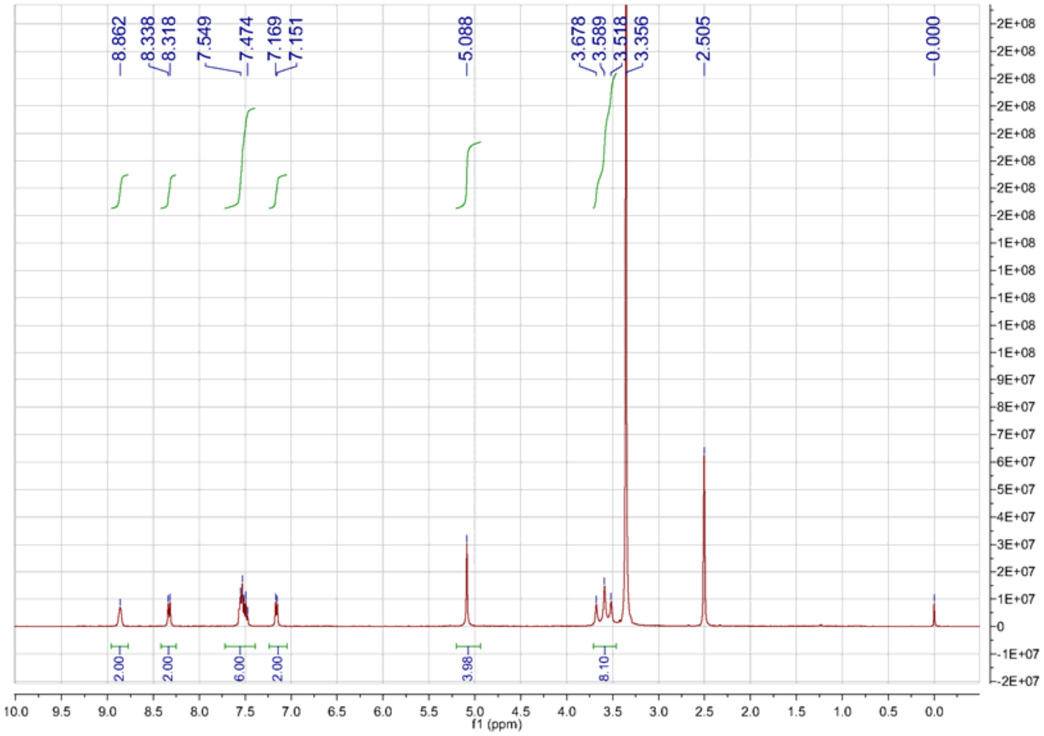
Figure S9. A proposed structure of **DQS**-Sn^{4+} complex.

The characterization data of all compounds

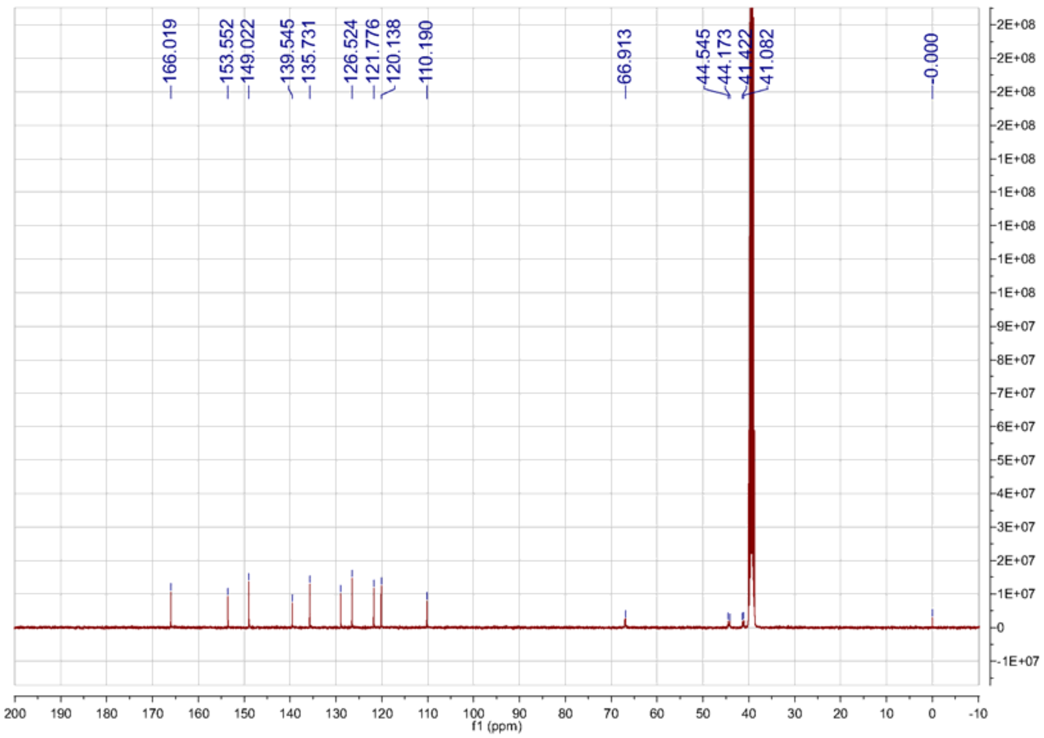
^1H NMR of compound **1**



^{1}H NMR of compound **2** (**DQS**)

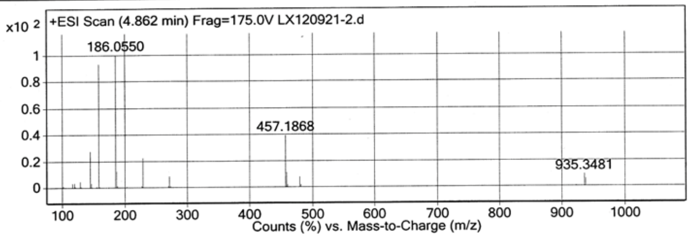


^{13}C NMR of compound **2** (**DQS**)



HRMS of compound **2** (**DQS**)

Qualitative Analysis Report



Peak List

m/z	z	Abund
145.052		154518.3
158.06	1	523667.7
159.0637	1	64905.2
186.055	1	562135.7
187.0584	1	70133.6
229.098	2	125555.2
272.1391		47858.4
457.1868	1	220235
458.1903	1	65325.7
935.3481	1	51051.1

References

(1) Velapoldi, R. A.; Tønnesen, H.; H. *J. Fluoresc.* **2004**, *14*, 465-472.

(2) Eaton, D. F. *Pure Appl. Chem*. **1988**, *60*, 1107-1114.

(3) Valeur, B. *Molecular Fluorescence Principle and Applications*; Wiley-VCH Verlag GmbH: New York, 2001.