Electronic Supplementary Information

Bioinspired Polydopamine Nanospheres: a Superquencher for Fluorescence Sensing of Biomolecules

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Preparation of PDANSs

PDANSs were synthesized according to a previous report with some modifications. Briefly, dopamine hydrochloride was added to the mixture of Tris-buffer (10 mM) and isopropyl alcohol with stirring. After stirred for some hours in dark, PDANSs was obtained. The suspension was centrifuged and washed/resuspended with water for several times. The precipitate was dried for the following experiment. By tuning the dopamine's concentration, the molar ratio of Tris-buffer to isopropyl alcohol and the polymerization time, the different sizes of PDANSs were obtained. When 100 mg dopamine hydrochloride was added to 100 mL Tris-buffer and 40 mL isopropyl alcohol, NS-1was obtained with stirring for 72 h. With the condition of 50 mg dopamine hydrochloride, 100 mL Tris-buffer and 50 mL isopropyl alcohol, NS-2 and NS-3 were obtained respectively, by controlling the reaction time as 2 h and 6 h. With the condition of 100 mg dopamine hydrochloride, 100 mL Tris-buffer and 50 mL isopropyl alcohol, NS-4 were obtained by

controlling the reaction time as 24 h.

Optimization of the incubation time

The fluorescence recovery has a relationship with the incubation time of P-FAM/NS-1 with the target. Hence, the incubation time was investigated. The result was shown in Figure S9. The fluorescent recovery was conducted at 37 ℃ under shaking. Upon increasing incubation time, more adsorbed P-FAM is released from NS-1, resulting in the restore of fluorescence gradually. When the incubation time was longer than 60 minutes, the intensity was no longer increased, showing that a balance is reached. Thus, 60 minutes was chosen as the incubation time.

Table S1 The excitation and emission wavelength of the fluorophores

Fluorophores	Excitation wavelength (nm)	Emission wavelength (nm)	Emission spectra range (nm)
AMCA	355	448	420 - 570
FAM	470	518	500 - 650
TAMRA	535	575	560 - 710
Cy5	625	660	650 - 800

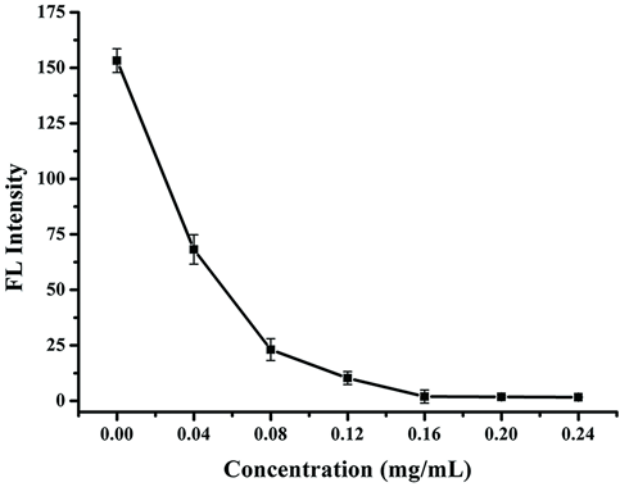

Fig. S1 Fluorescence intensity of P-FAM (25 nM) upon the introduction of different concentration of NS-1.

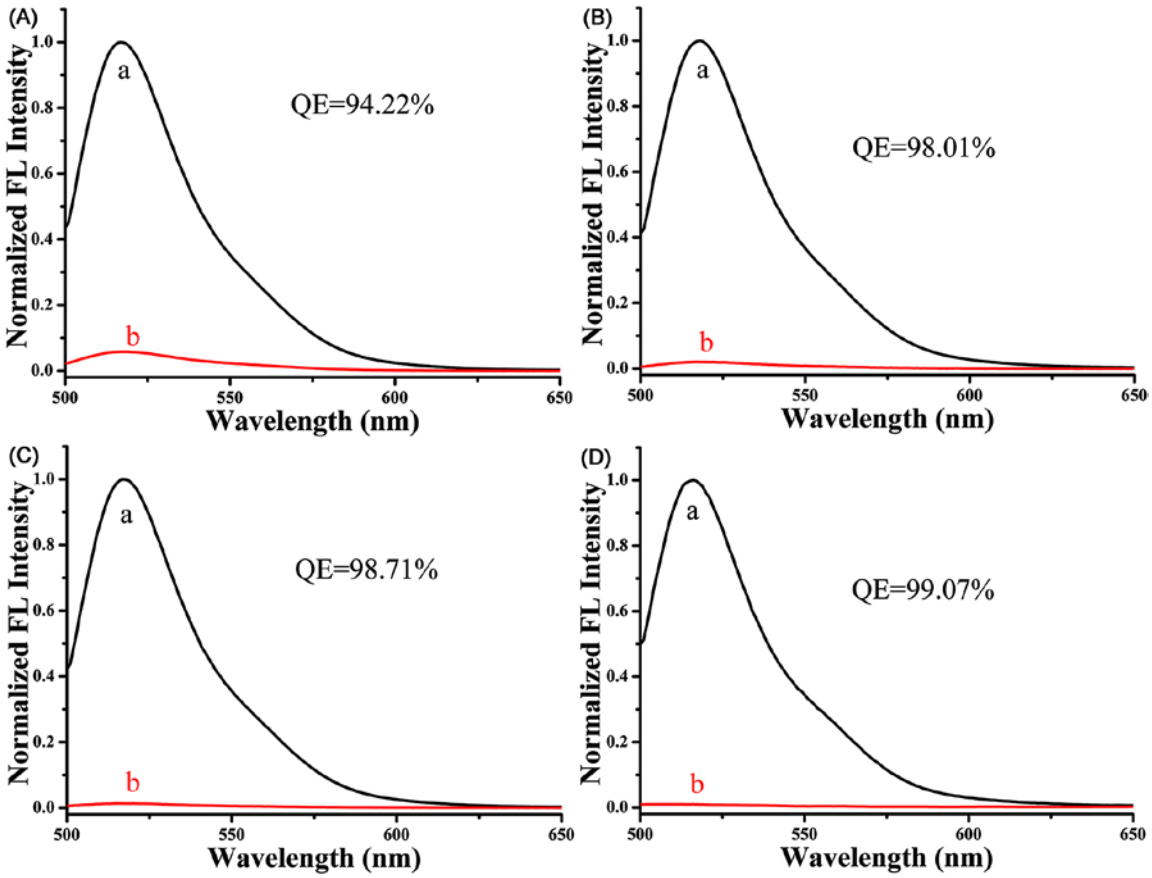

Fig. S2 (A) Fluorescence emission spectra of probe DNA (a) P-A and (b) P-A in the presence of NS-1. The quenching efficiency is 94.22%. (B) Fluorescence emission spectra of probe DNA (a) P-T and (b) P-T in the presence of NS-1. The quenching efficiency is 98.01%. (C) Fluorescence emission spectra of probe DNA (a) P-C and (b) P-C in the presence of NS-1. The quenching efficiency is 98.71%. (D) Fluorescence emission spectra of probe DNA (a) P-3FAM and (b) P-3FAM in the presence of NS-1. The quenching efficiency is 99.07%.

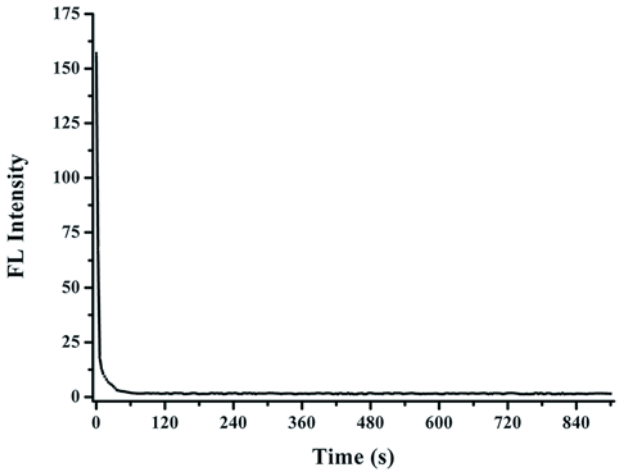

Fig. S3 Fluorescence quenching of P-FAM in Tris-HCl buffer by NS-1 as a function of time.

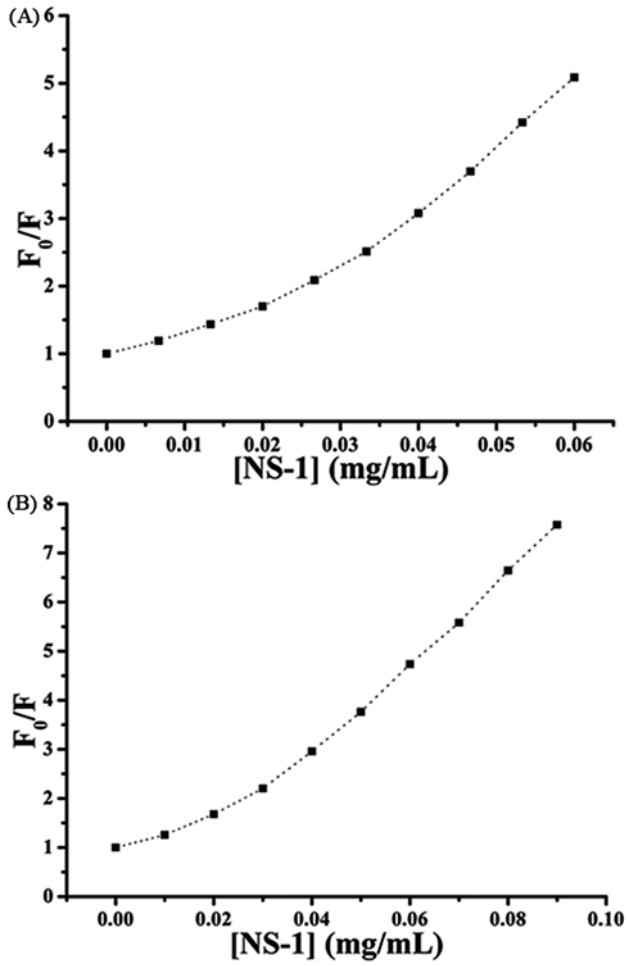

Fig. S4 Stern-Volmer plots for 25 nM (A) P-Cy5 and (B) P-FAM. F_0 and F are the fluorescence intensity of the fluorophore in the absence and presence of NS-1, respectively.

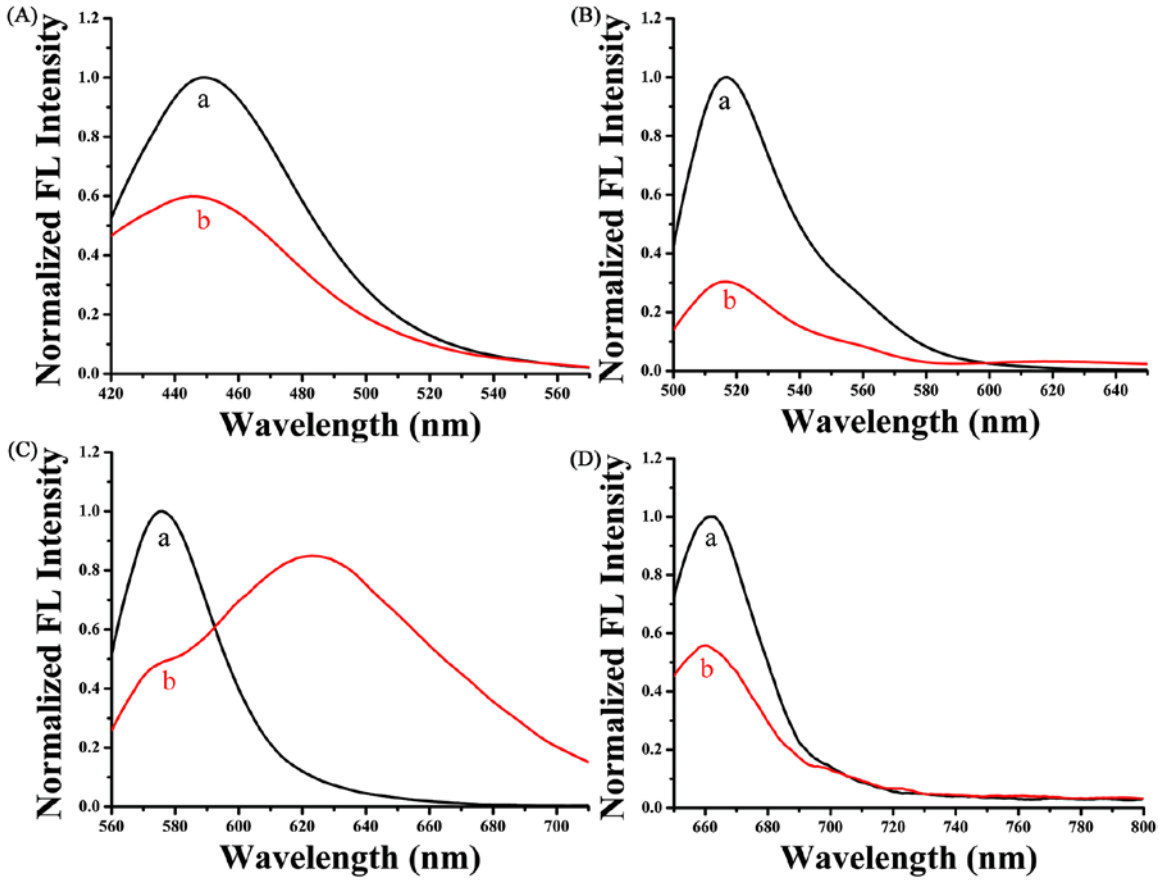

Fig. S5 (A) Fluorescence emission spectra of probe DNA (a) P-AMCA and (b) P-AMCA in the presence of dopamine. (B) Fluorescence emission spectra of probe DNA (a) P-FAM and (b) P-FAM in the presence of dopamine. (C) Fluorescence emission spectra of probe DNA (a) P-TAMRA and (b) P-TAMRA in the presence of dopamine. (D) Fluorescence emission spectra of probe DNA (a) P-Cy5 and (b) P-Cy5 in the presence of NS-1. The peak at about 625 nm of curve b in (C) is from dopamine.

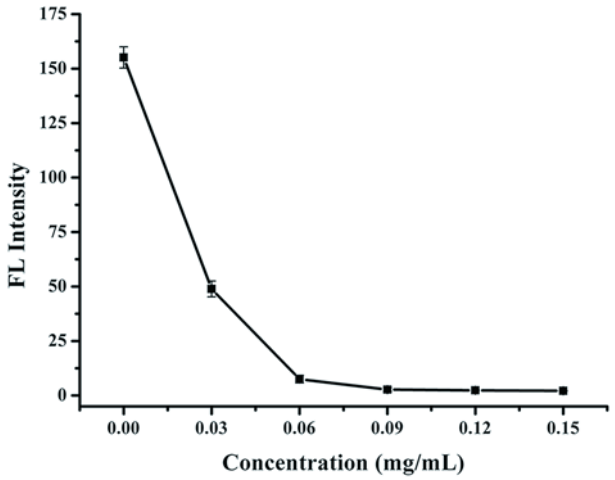

Fig. S6 Fluorescence intensity of P-FAM (25 nM) upon the introduction of different concentration of NS-2.

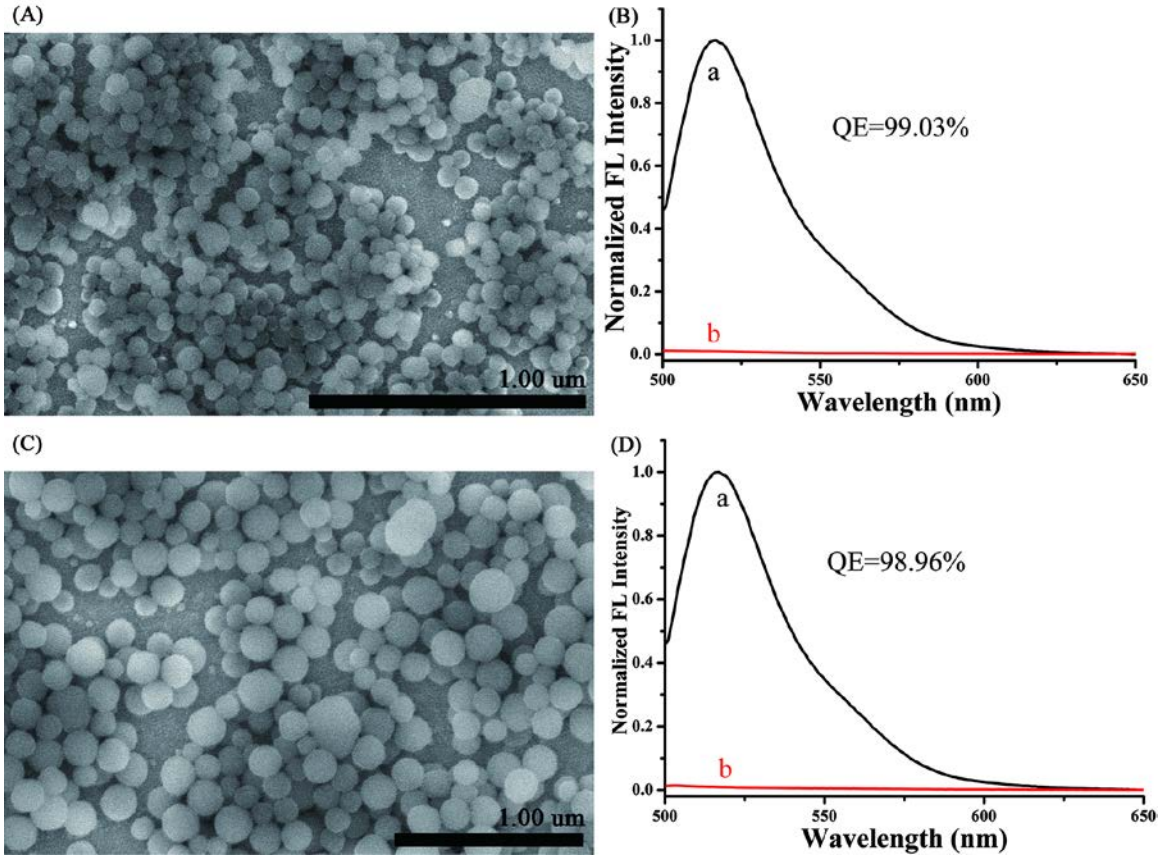

Fig. S7 (A) SEM image of NS-3, the diameter is 85.8±10.1 nm. (B) Fluorescence emission spectra of probe DNA (a) P-FAM and (b) P-FAM in the presence of NS-3. (C) SEM image of NS-4, the diameter is 176.7±22.6 nm. (D) Fluorescence emission spectra of probe DNA (a) P-FAM and (b) P-FAM in the presence of NS-4.

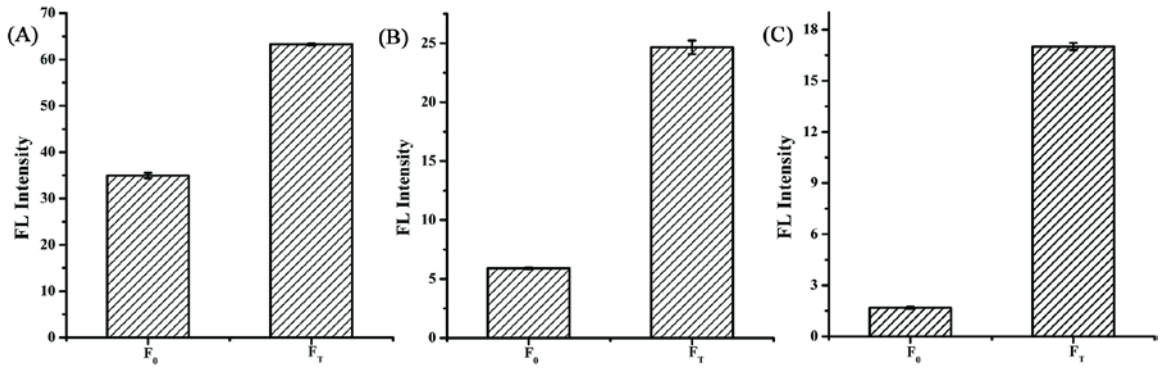

Fig. S8 (A) Fluorescence intensity of P-A/NS-1 in the absence (F_0) and presence (F_T) of target DNA T-T. (B) Fluorescence intensity of P-T/NS-1 in the absence (F_0) and presence (F_T) of target DNA T-A. (C) Fluorescence intensity of P-3FAM/NS-1 in the absence (F_0) and presence (F_T) of target DNA T1.

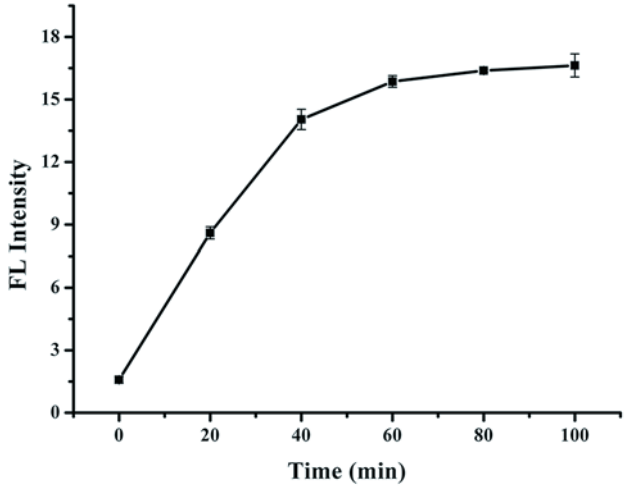

Fig. S9 The influence of the incubation time between the P-FAM/NS-1 and target DNA T1 on the fluorescence intensity.

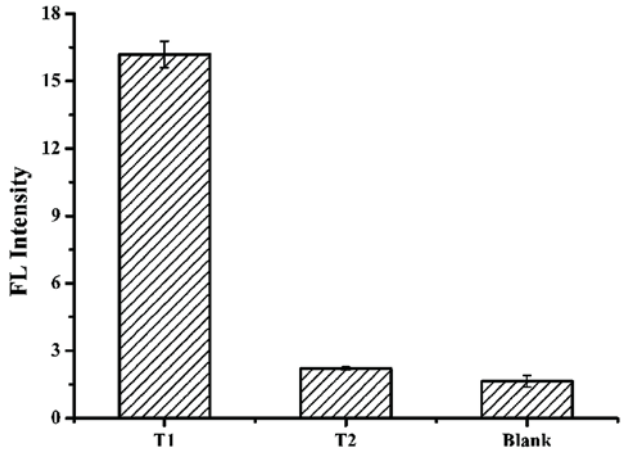

Fig. S10 Fluorescence intensity of P-FAM/NS-1 towards target DNA T1 (25 nM) and triple-base mismatched DNA T2 (250 nM).

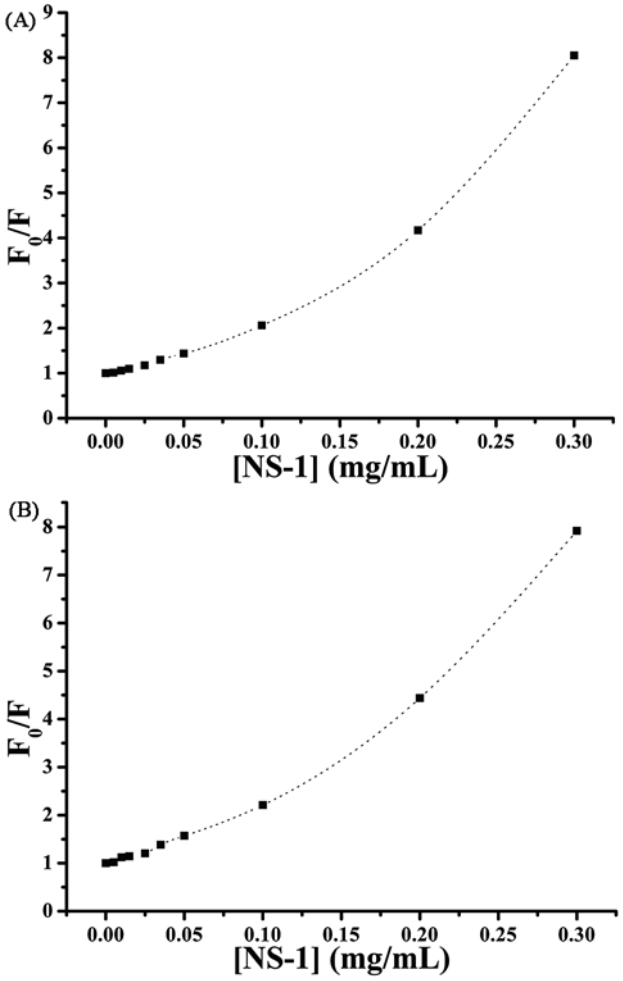

Fig. S11 Stern-Volmer plots for 25 nM (A) free FAM and (B) free TAMRA. F_0 and F are the fluorescence intensity of the fluorophore in the absence and presence of NS-1, respectively.