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A facile intracellular fluorescent probe for hydrazine and its application

Jie Zhao[a], Yongqian Xu[a*], Hongjuan Li[a], Aiping Lu[b*], Shiguo Sun[a*]

[a] *College of Science, Northwest A&F University, Yangling, Shaanxi, 712100, China, E-mail: xuyq@nwsuaf.edu.cn, sunsg@nwsuaf.edu.cn*

[b] *Institute of Basic Research in Clinical Medicine, China Academy of Chinese Medical Sciences, Dongzhimen, Beijing 100700, China, E-mail:* lap64067611@126.com

Supplementary information

Materials, CF_3COOH, acenaphthenequinone and malononitrile reagents were purchased from Aladdin (China). Other chemicals and solvents were used as received unless specifically noted. **1** was synthesized and purified according to the reported literature.

Measurements

Absorption and emission spectra were collected by using a Shimadzu 1750 UV-visible spectrometer and a RF-5301 fluorescence spectrometer (Japan), respectively. Cell images were performed on Ziss LSM-510META confocal microscope (Gemany). All experiments were performed in compliance with the relevant laws and institutional guidelines, and were approved by Northwest A&F University. Informed consent was obtained for all human subjects.

Sample Preparation and Titration. Stock solutions of hydrazine and relative chemicals were prepared with concentration of 1.0×10^{-2} M. Stock solution of compound **1** (2×10^{-3} M) was prepared in CH_3CN and further diluted to 5.0×10^{-6} M for titration experiments.

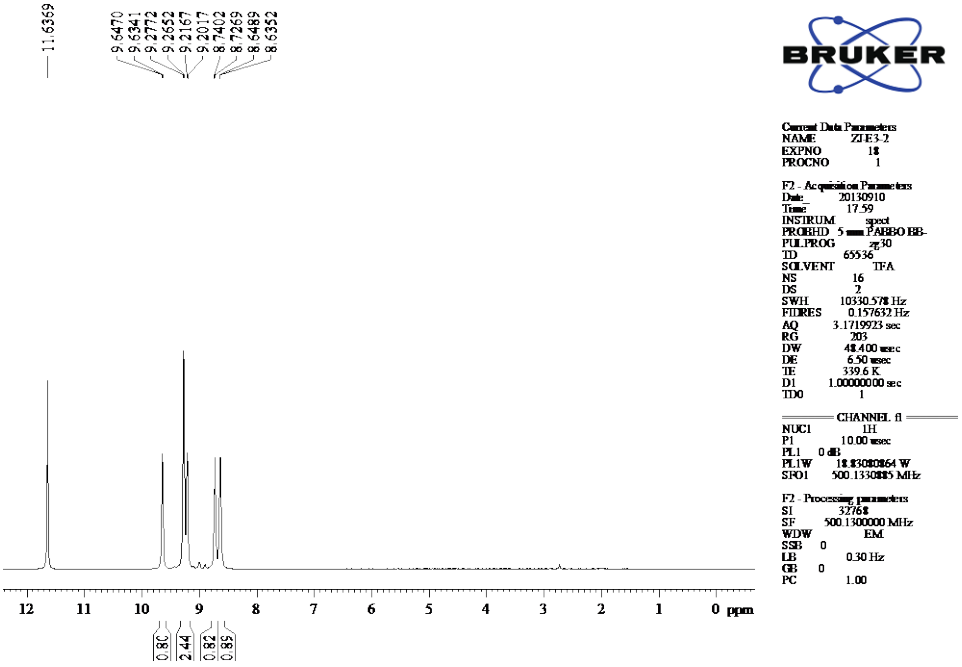

Fig. S1 ^{1}H NMR spectra of **1** in TFA

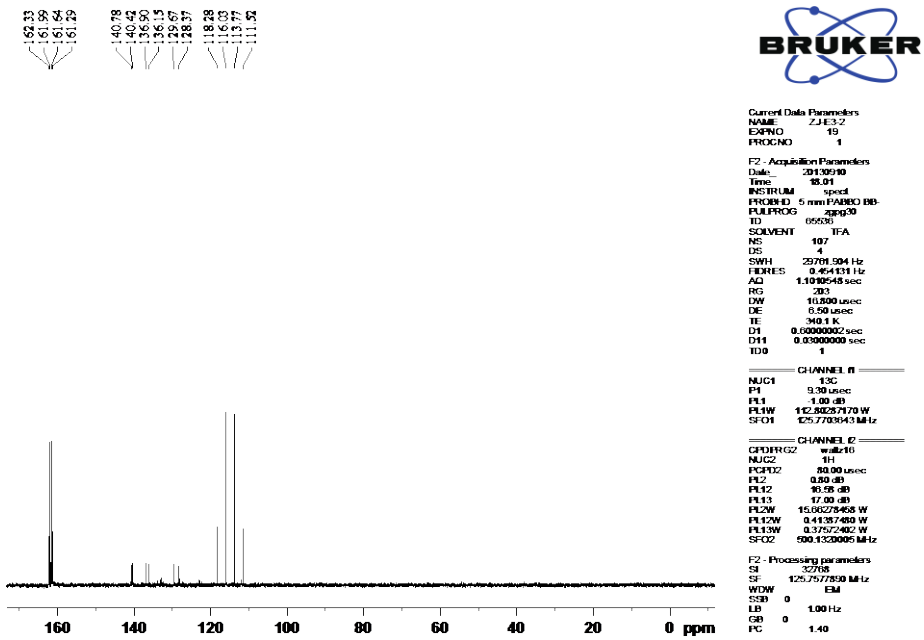

Fig. S2 ^{13}C spectra of **1** in TFA.

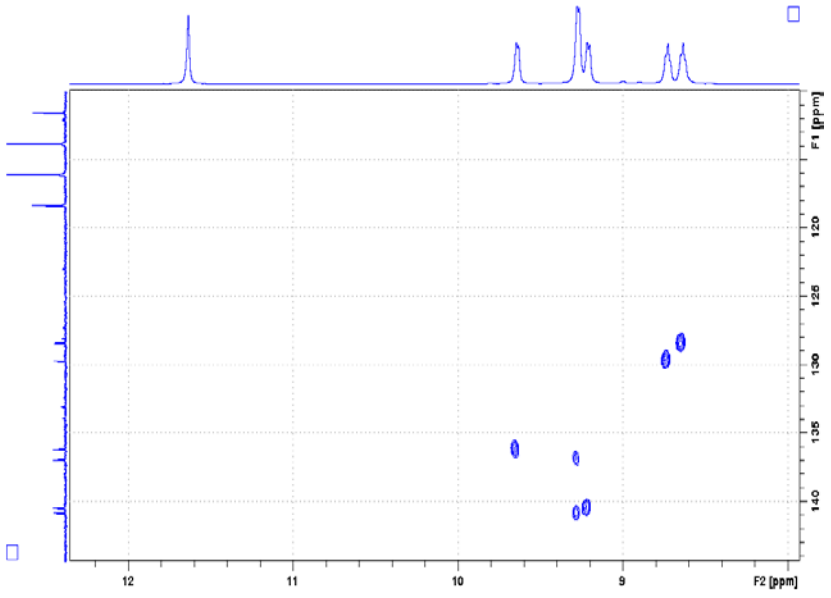

Fig. S3 HSQCGP spectra of **1** in TFA.

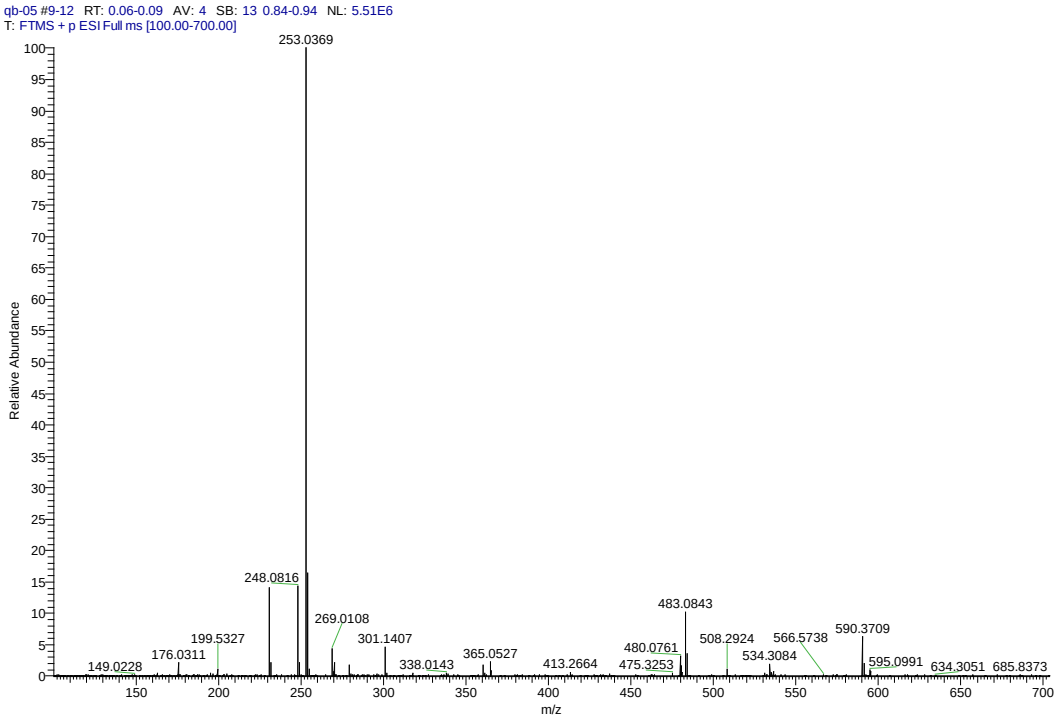

Fig. S4 EI-MS spectrum of compound **1**.

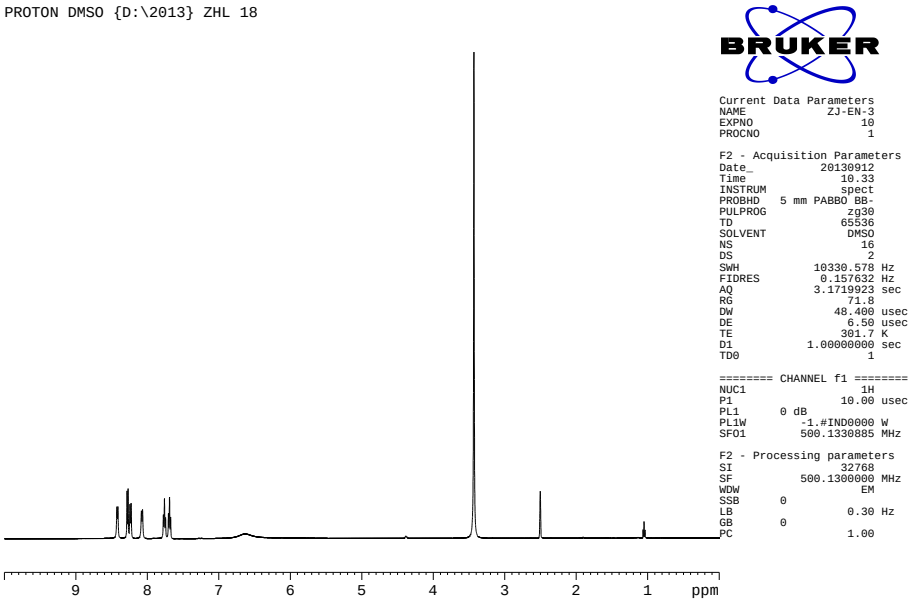

Fig. S5 ^{1}H NMR spectra of **2** in DMSO-d_6.

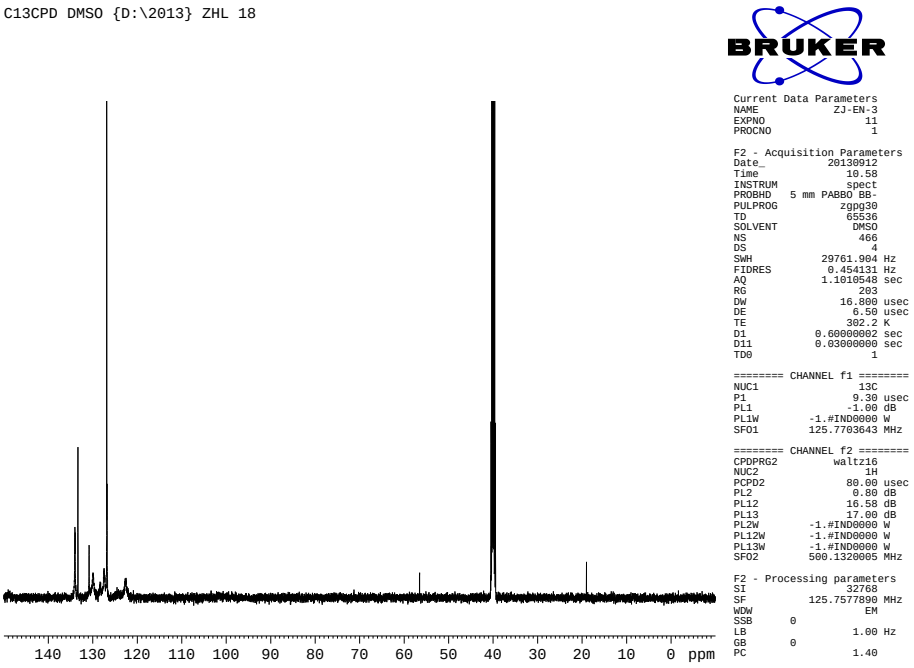

Fig. S6 ^{13}C spectra of **2** in DMSO-d_6.

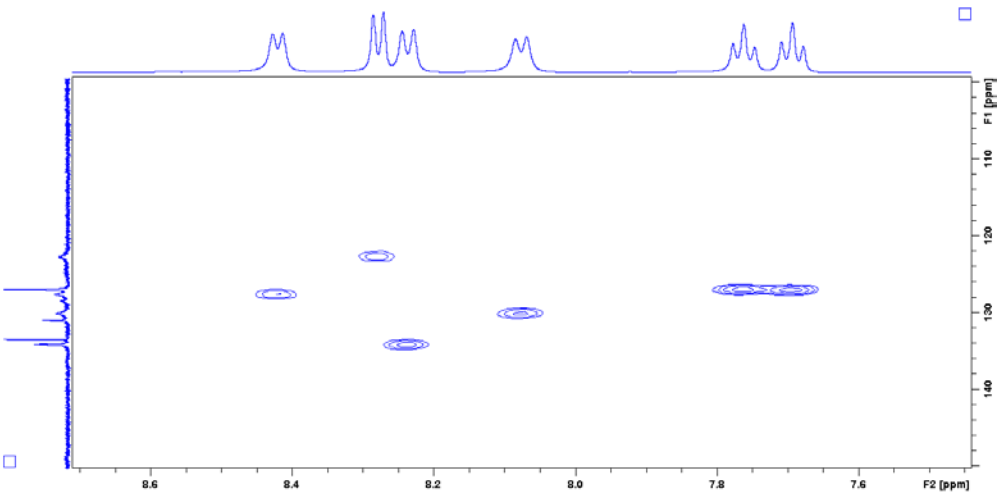

Fig. S7 HSQCGP spectra of **2** in DMSO-d_6.

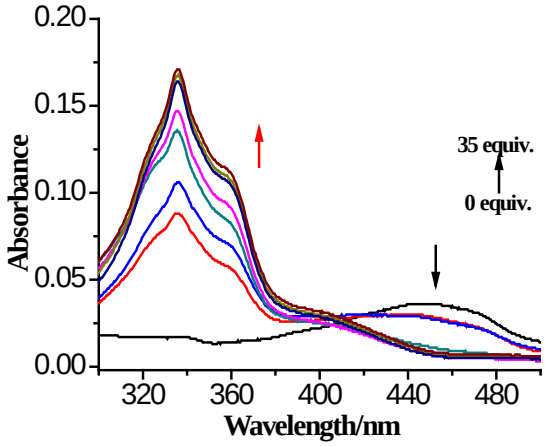

Fig. S8 UV-vis spectra of probe **1** (20 μM) in the presence of different concentrations of hydrazine in a mixture of PBS/CH_3CN solution (9/1, V/V, pH 7.4). Each spectrum was recorded after 40 min of mixing. The arrows indicate the change of the absorption with the increasing of hydrazine.

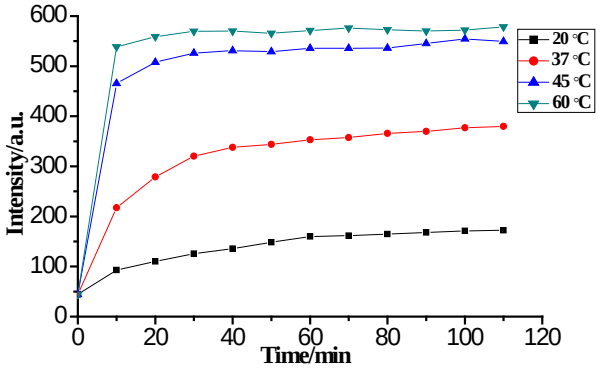

Fig. S9 The probe **1** (5 μM) and 120 μM N_2H_4 were equilibrated in different temperature, the fluorescence intensity was acquired in 0.2 M PBS/CH_3CN (9/1, V/V, pH 7.4) with emission at 565 nm.

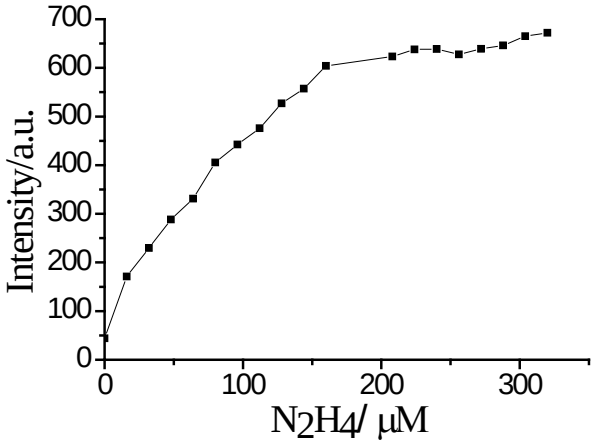

Fig. S10 Emission spectra of probe **1** (5 μM) upon addition of increasing concentrations of hydrazine (0 - 64 equiv.) in PBS/CH_3CN (9/1, V/V, pH 7.4).

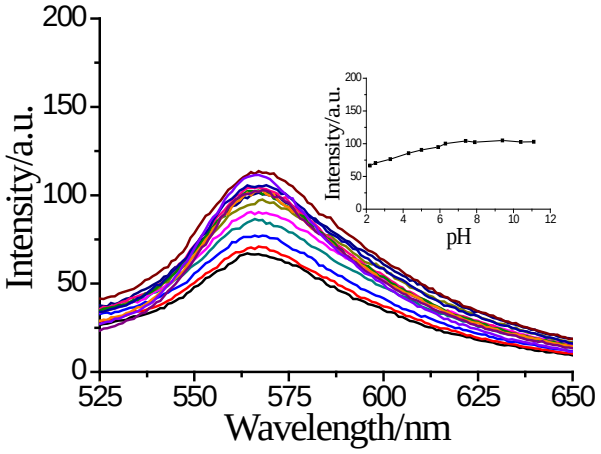

Fig. S11 The effect of pH value on the fluorescence intensity of probe **1** (30 μM) in H_2O/CH_3CN (9/1, V/V). pH values: 2.2, 2.5, 3.3, 4.3, 5.0, 5.9, 6.3, 6.7, 7.4, 7.9, 9.4, 10.4, 11.1.

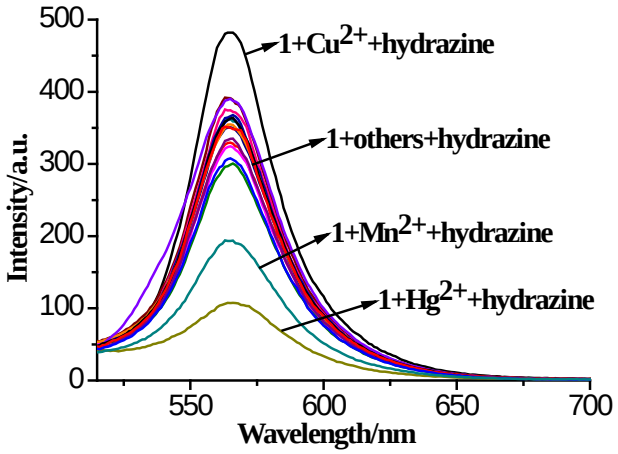

Fig. S12 Fluorescence spectra of **1** in the presence of representative metal ions, anions and hydrazine. Probe **1** = 5 μM, hydrazine = 96 μM, 120 μM for Cu^{2+}, Ba^{2+}, Mg^{2+}, Cd^{2+}, Pb^{2+}, Hg^{2+}, Zn^{2+}, Fe^{3+}, SCN^{-}, I^{-}, HCO_3^{-}, Br^{-}, Na^{+}, SO_3^{2-}, SO_4^{2-}, Cl^{-}, HPO_4^{2-}, Mn^{2+}. In a mixture of PBS/CH_3CN (9/1, V/V, pH 7.4), measured after 40 min of mixing.

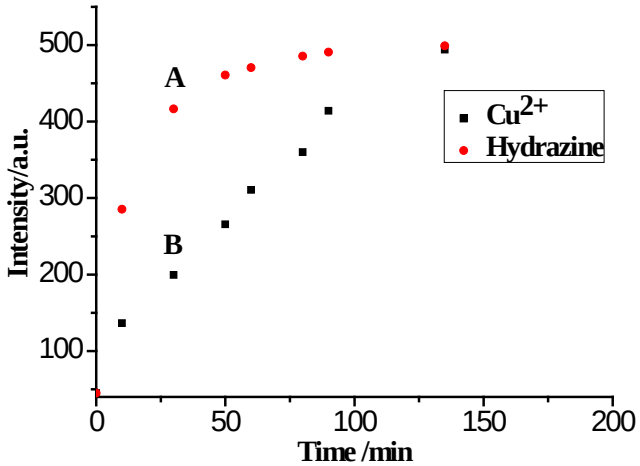

Fig. S13 Response of **1** to addition of (A) 96 μM hydrazine and (B) 120 μM Cu^{2+}, respectively.

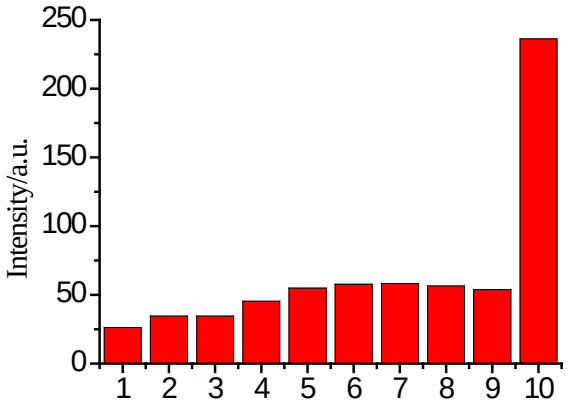

Fig. S14 Fluorescence responses of probe **1** (5 μM) to various amine-containing compounds (120 μM for ethanediamine, triethylamine, ammonia, thiourea, NH_4^+, Cys, Lys, Glu) and hydrazine (120 μM) at 565 nm. In a mixture of PBS/CH_3CN (9/1, V/V, pH 7.4), measured after 40 min of mixing. 1. blank, 2. ethanediamine, 3. triethylamine, 4. ammonia, 5. thiourea, 6. NH_4^+, 7. Cys, 8. Lys, 9. Glu and 10. hydrazine.

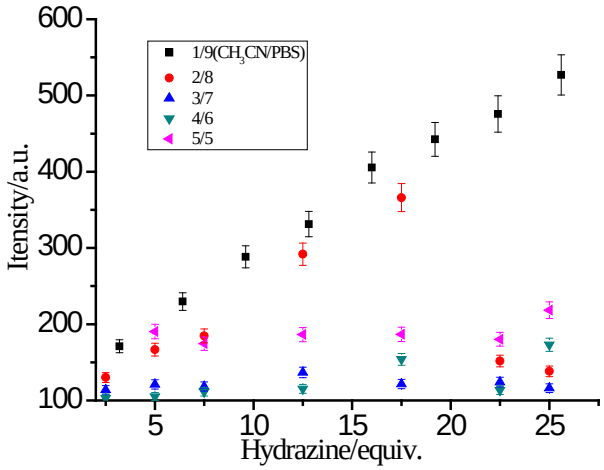

Fig. S15 The effect of different ratio of CH_3CN to PBS on the response of the probe to hydrazine.