

Supporting Information

Rhodamine-anchored polyacrylamide hydrogel for fluorescent naked-eye sensing of Fe³⁺

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1 EXPERIMENTAL

1.1 NMR characterization of the product RBNH and RBNCH

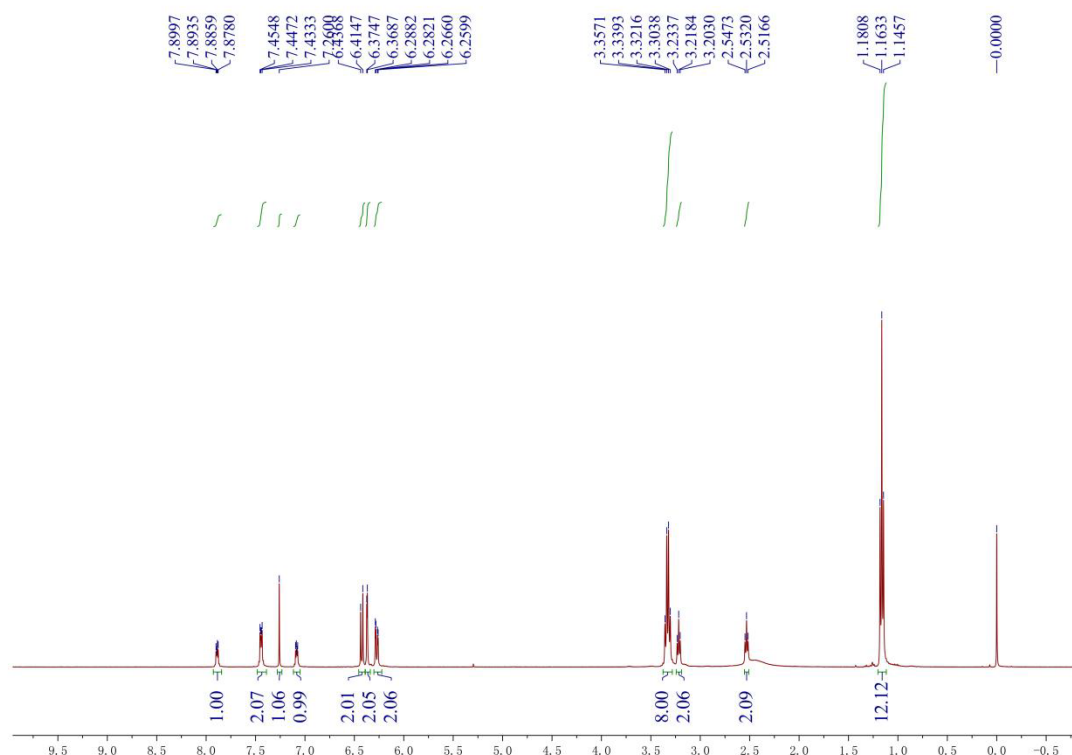


Figure S1. The ¹H NMR spectra of RBNH.

The ¹H NMR spectra of RBNH was shown as Fig. S1. ¹H NMR (400 MHz, CDCl₃) δ 7.89 (dd, *J* = 5.9, 2.8 Hz, 1H), 7.49 – 7.40 (m, 2H), 7.08 (dd, *J* = 5.8, 2.8 Hz, 1H), 6.43 (d, *J* = 8.8

Hz, 2H), 6.37 (d, $J = 2.4$ Hz, 2H), 6.27 (dd, $J = 8.9, 2.4$ Hz, 2H), 3.33 (q, $J = 7.1$ Hz, 8H), 3.22 (t, $J = 6.1$ Hz, 2H), 2.53 (t, $J = 6.1$ Hz, 2H), 1.16 (t, $J = 7.0$ Hz, 12H).

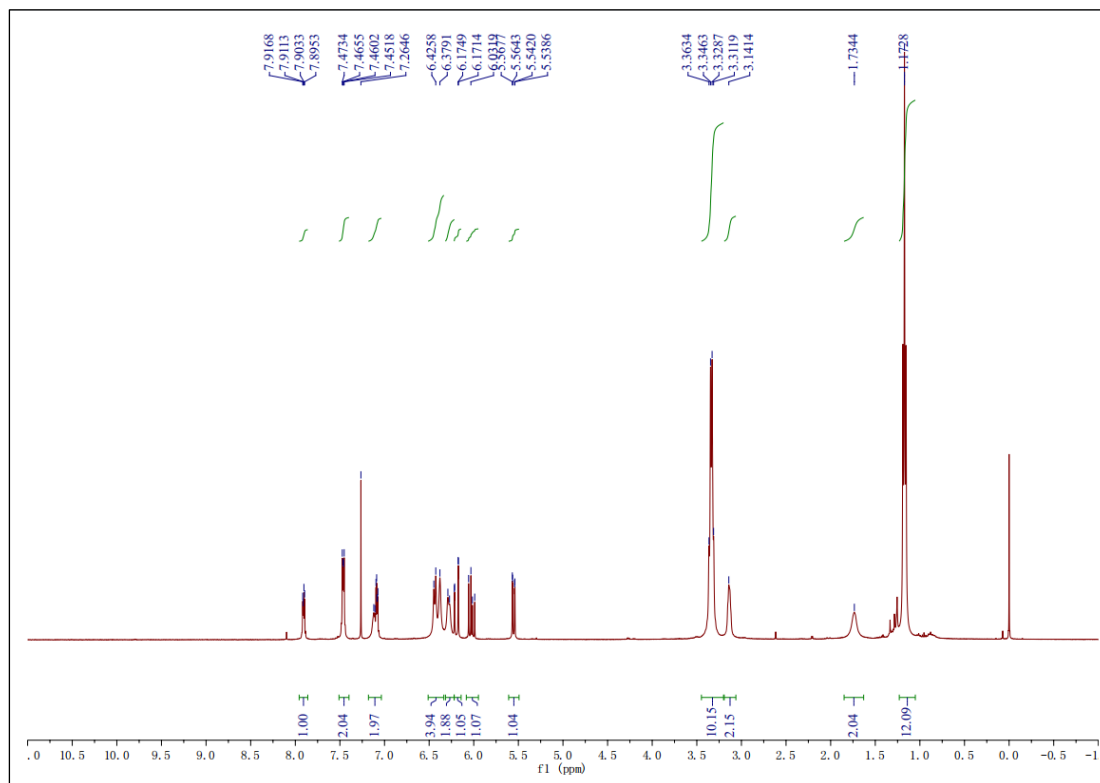


Figure S2. The ^1H NMR spectra of probe **RBNCH**.

The ^1H NMR spectra of **RBNCH** was shown as Fig. S2. ^1H NMR (400 MHz, CDCl_3) δ 7.91 (dd, $J = 5.9, 2.7$ Hz, 1H), 7.46 (dd, $J = 5.4, 3.3$ Hz, 2H), 7.18 – 7.04 (m, 2H), 6.51 – 6.34 (m, 4H), 6.28 (d, $J = 7.3$ Hz, 2H), 6.19 (dd, $J = 17.1, 1.4$ Hz, 1H), 6.02 (dd, $J = 17.1, 10.3$ Hz, 1H), 5.55 (dd, $J = 10.3, 1.3$ Hz, 1H), 3.34 (q, $J = 6.8$ Hz, 10H), 3.14 (s, 2H), 1.73 (s, 2H), 1.17 (s, 12H).

P165-RBNCH #13 RT: 0.17 AV: 1 NL: 5.15E9
T: FTMS + p ESI Full ms [100.0000-1500.0000]

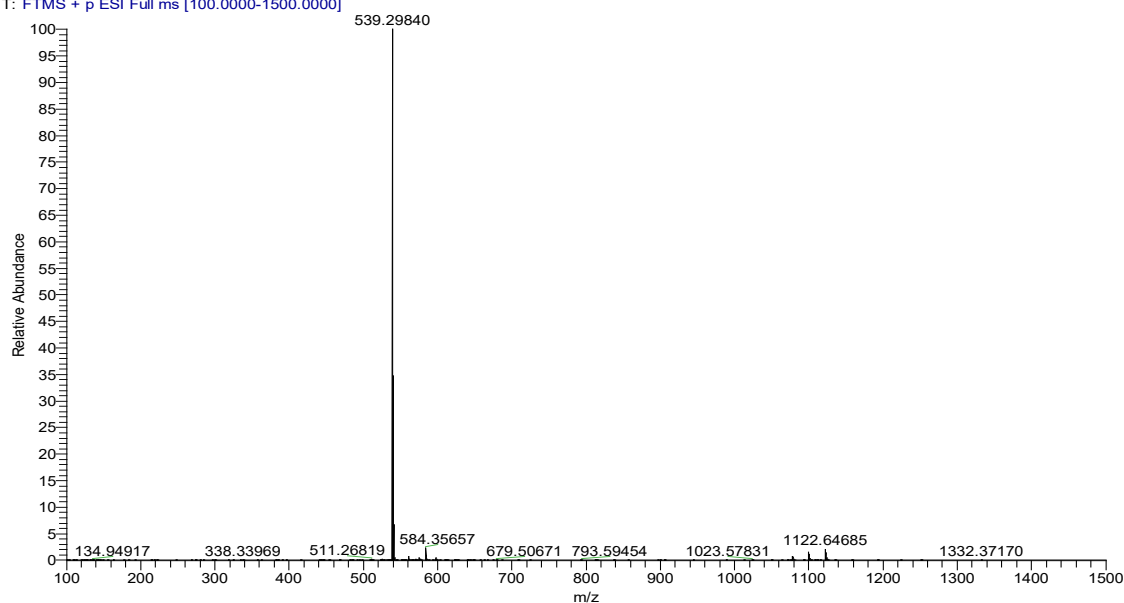


Figure S3. The HRMS spectra of probe **RBNCH**.

1.2 Detection of Fe^{3+} in various percentages of water in CH_3CN

The stock solutions of **RBNCH** (5 mM) were prepared in CH_3CN , FeCl_3 (5 mM) were prepared in deionized water. For the detection of Fe^{3+} in various percentages of water in CH_3CN , various amount stock solutions of **RBNCH** and Fe^{3+} were added into dilutes with $\text{H}_2\text{O}/\text{CH}_3\text{CN}$ ratio range from (9:1) to (1:9), diluting to the testing solution consist of **RBNCH** (100 μM) and Fe^{3+} (100 μM). Then the mixture was incubated at room temperature for 1.5 h. Emission spectra were measured in the range of 385 nm to 700 nm with an excitation wavelength at 308 nm, and the slit width is 10 nm/10 nm.

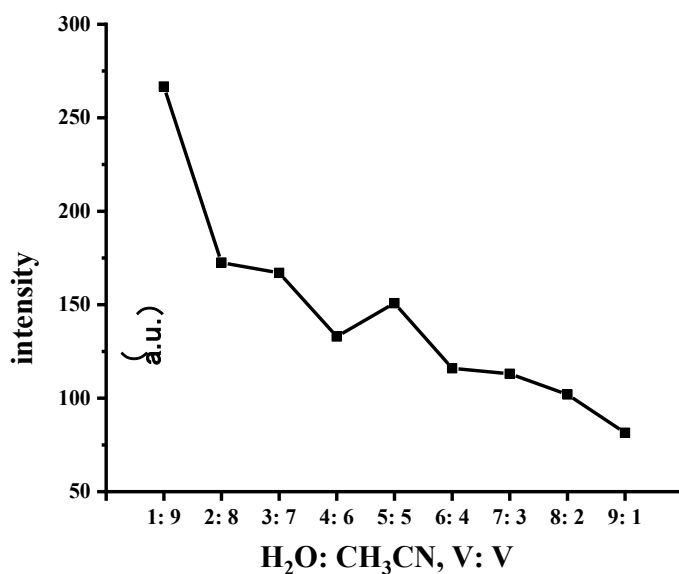


Figure S4. The fluorescence spectra of different water content. Fluorescence emission spectra ($\lambda_{\text{ex}} = 308 \text{ nm}$) of the sensing system containing 50 μM **RBNCH**, with 100 μM Fe^{3+} in different ratios of $\text{H}_2\text{O}/\text{CH}_3\text{CN}$.

1.3 Detection of Fe^{3+} in different fluorescence response time.

RBNCH (50 μM), FeCl_3 (100 μM) were added into various percentages of water in CH_3CN (water content 10%), and then the mixture was incubated at room temperature to test the fluorescence response at different time. Emission spectra were measured in the range of 385 nm to 700 nm with an excitation wavelength at 308 nm, and the slit width is 10 nm/10 nm.

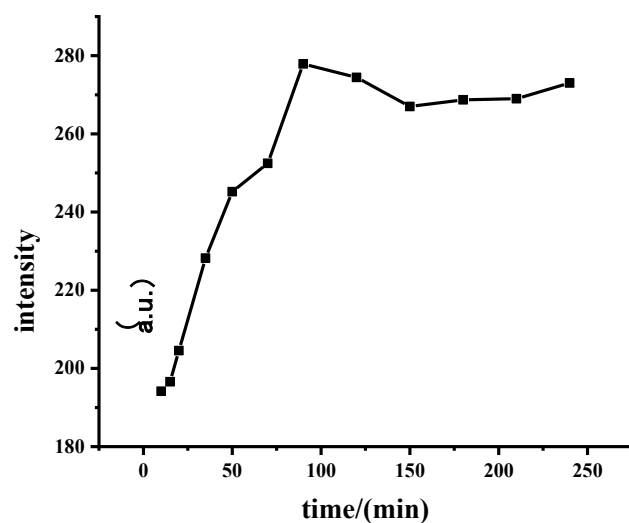


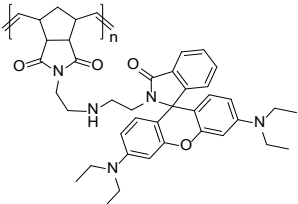
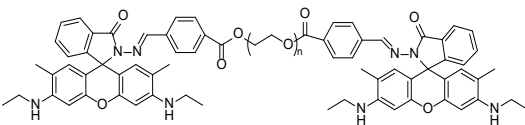
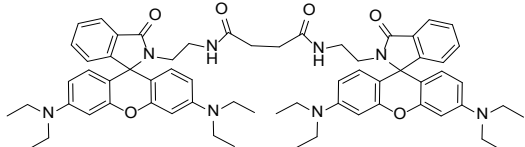
Figure S5. The fluorescence spectra of response time. Fluorescence emission spectra ($\lambda_{\text{ex}} = 308 \text{ nm}$) of the sensing system containing $50 \mu\text{M}$ RBNCH, with $100 \mu\text{M}$ Fe^{3+} for different reaction time.

2. COMPARISON OF THE FLUORESCENT PROBE WITH OTHER REPORTED PORBES.

The sensitivity data of several fluorescent probes for the detection of Fe^{3+} were compared with **RBNCH** as shown in table S1. It can be seen that **RBNCH** possesses the wider linear scope and higher sensitivity compared with the reported probes.

Table S1. Comparison of the proposed method for Fe^{3+} detection with other previously reported fluorescent probes.

Entry	Probe	Ex/Em (nm)	Linear range (μM)	LOD (nM)	Ref.
1		500/579	0-25	122	[1]

2		520/580	0-200	19	[2]
3		394/555	40-200	1×10 ³	[3]
4		505/585	0.3-14	12.4	[4]
5	An optical fiber sensor based on fluorescent carbon dots	370/475	100-1000	3×10 ⁵	[5]
6	Highly fluorescent carbon polymer dots	350/430	0.2-10	100	[6]
7	Fluorochromic hydrogels	550/665	1-40	150	[7]
8	Carbon quantum dots-based fluorescent hydrogel hybrid	370/450	0-150	240	[8]
9	RBNCH (this work)	308/586	100-200	27	Thiswork

References

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