

Supporting Information

A long-wavelength ultrasensitive colorimetric fluorescent probe for carbon monoxide detection in living cells

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1. The detailed optical titration experiments of probe LW-CO for detecting CORM-2

Firstly, the stock solutions of probe **LW-CO** (1 mM) and PdCl_2 (1 mM) were dissolved in 10 mL colorimetric tube by DMSO. Next, 200 mL of the probe solution (5 μM **LW-CO** + 10 μM PdCl_2 , containing 5 mM PBS, pH 7.4, with 20% DMSO, v/v) was prepared in a beaker. Then the probe solution was divided to 25 sets of parallel samples in colorimetric tube and every tube contained 5 mL of probe solution. Finally, 2.5 mg CORM-2 was dissolved in 5 mL DMSO and then rapidly transferred different volumes of CORM-2 solution (V/ μL : 0, 2.5, 5, 7.5, 10, 12.5, 15, 17.5, 20, 22.5, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100, 125, 150, 175, 200) into above parallel samples with a micro pipette. So the final concentrations of CORM-2 were 0, 0.5 μM , 1 μM , 1.5 μM , 2 μM , 2.5 μM , 3 μM , 3.5 μM , 4 μM , 4.5 μM , 5 μM , 6 μM , 7 μM , 8 μM , 9 μM , 10 μM , 12 μM , 14 μM , 16 μM , 18 μM , 20 μM , 25 μM , 30 μM , 35 μM , 40 μM . The final probe–CORM-2 mixture solutions were reacted at room temperature. The reaction results were collected by fluorescence spectrophotometer 20 mins later. Three series of parallel experiments were carried out, respectively.

Similarly, the reaction results of probe solution with low dosage of CORM-2 were also obtained by above method. Initially, the probe solution (5 μM **LW-CO** + 10 μM PdCl_2 , containing 5 mM PBS, pH 7.4, with 20% DMSO, v/v) was divided to 16 sets of parallel samples in 10 mL colorimetric tube. And then different volumes of CORM-2 solution (V/ μL : 0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100) from the freshly prepared CORM-2 stock solution (100 μM , 2.5 mg to 50 mL DMSO)

were transferred into above probe solution to obtain different concentrations of CORM-2 solution (C/nM: 0, 50, 100, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900, 1000). The final probe–CORM-2 mixture solutions were reacted at room temperature. The reaction results were collected by fluorescence spectrophotometer 20 mins later. Three series of parallel experiments were carried out, respectively.

2. The ability of probe LW-CO for CO detection in different pH environments

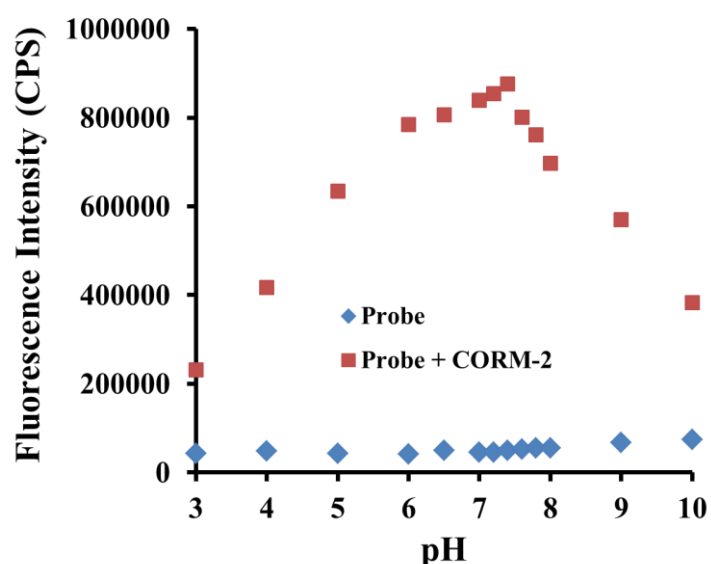


Figure S1. The effects of pH on the fluorescence intensities of probe **LW-CO** (5 μ M) and on the recognition property of probe **LW-CO** (5 μ M) for CORM-2 (30 μ M).

3. The competitive experiment of probe LW-CO toward CO with relevant analytes

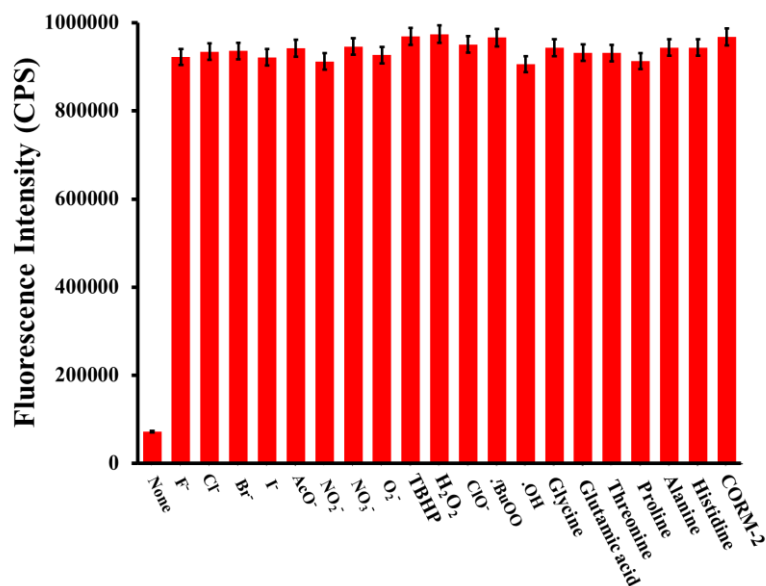
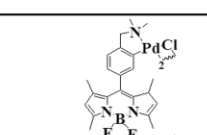
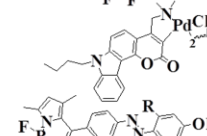
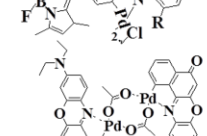
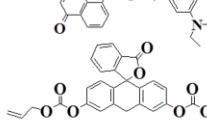
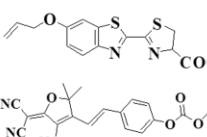
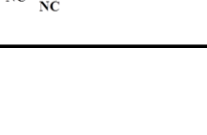


Figure S2. The competitive experiment of probe LW-CO (5 μ M) toward CO (30 μ M) with relevant analytes (100 μ M).

4. The comparison of the performances of probe LW-CO with reported probes

Table S1 The comparison of the performance of probe LW-CO with reported probes

Probes	Detection Limit (nM)	Response time (min)	Temperature (°C)	Emission Wavelength (nm)	References
	--	60	37	507	J. Am. Chem. Soc., 2012, 134, 15668
	653	40	37	477	Chem. Sci., 2014, 5, 3439
	720	30	37	512	Anal. Chem., 2016, 88, 11154
	50	60	37	660	Angew. Chem. Int. Ed., 2017, 56, 13489
	37	15	37	520	Anal. Chem., 2016, 88, 10648
	--	15	r.t.	--	Anal. Chem., 2018, 90, 5951
	3.2	20	r.t.	605	This work

5. The determination of detection limit

The detection limit was calculated based on the fluorescence titration. The fluorescence spectra of free probe **LW-CO** were measured by five times and its standard deviation was obtained. To gain the slope, the fluorescence intensities at 605 nm was plotted as the increasing concentrations of CORM-2. So, the detection limit was calculated with the following equation (1):

$$\text{Detection limit} = 3\sigma/k \quad (1)$$

Where σ is the standard deviation of blank measurement, k is the slope between the fluorescence intensities versus the concentrations of CORM-2.