Electronic Supplementary Material (ESI) for New Journal of Chemistry.

Supporting information for

A mitochondria-targetable fluorescent probe with large Stokes shift for detecting hydrogen peroxide in aqueous solution and living cells

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Table of contents

Table S1. Properties of the representative hydrogen peroxide probes developed and the **CAI** reported in this work.

Ref.	Core structure	Stokes shift *in aqueous solution*	Probe Type	Maximum absorption wavelength and emission wavelength *in aqueous solution*	Application
This work	**Carbazole-based derivatives CAI**	157 nm	Turn off	418/575 nm	Detecting hydrogen peroxide in pure water and mitochondria *via* fluorescence quenching
1	NBzF	24 nm	Turn on	495/519 nm	Highly Sensitive detecting hydrogen peroxide
2	SERS nanoprobe	–	Turn on	–	Ratiometric imaging of hydrogen peroxide in living cells
3	MI-H_2O_2	–	Turn on	425 /-nm	Simultaneous fluorescence imaging of hydrogen peroxide in mitochondria
4	Cy-B	–	Turn on	575/- nm	Imaging endogenous hydrogen peroxide during an autophagy process induced by rapamycin
5	Polymer 3	20 nm			Highly

			Turn off	330/ 350 nm	efficient detection of hydrogen peroxide in solution
6	Prototype probe 1	–	Turn on	–	Highly Sensitive detecting hydrogen peroxide
7	TPE-BO	100 nm	Turn on	400/500nm	Rapid-Response detecting hydrogen peroxide in living cells
8	D-HMSE	–	Turn on	–	highly selective detecting hydrogen peroxide
9	QCy-BA-Drew-AT	90 nm	Turn on	410 /500 nm	Reporting of cellular hydrogen peroxide
10	TPE-HPro	–	Turn on	–	Highly sensitive detection of hydrogen peroxide and glucose
11	Ir-2	–	Turn on	–	Recognition of hydrogen peroxide
12	DCM-B2	–	Turn on	–	Hydrogen peroxide imaging *in vitro* and *in vivo*
13	CBZ-H_2O_2	–	Turn on	–	Imaging of mitochondrial hydrogen

					peroxide in living cells and tissues
14	Mito-VH	–	Turn on	–	Dual-Imaging viscosity and H_2O_2 in Mitochondria
15	CSBOH	100 nm	Turn on	570 /670 nm	Imaging H_2O_2 imaging in *vitro* and in *vivo*
16	FP-H_2O_2-NO	–	Turn on	–	Imaging H_2O_2 in *vitro* and in *vivo*
17	Mito-H_2O_2	–	Turn on	365 /-nm	Imaging mitochondrial hydrogen peroxide in living cells
18	PF1	–	Turn on	–	Imaging H_2O_2 in living cells
19	MitoPY1ox	18 nm	Turn on	510 / 528nm	Imaging mitochondrial H_2O_2 in living cells
20	probe 3	–	Turn on	–	Imaging H_2O_2 in *vitro* and in *vivo*
21	QCy7	–	Turn on	560/-nm	Noninvasive intravital optical imaging of hydrogen peroxide
22	pep3-NP1	48 nm	Turn on	352/400 nm	Detection of hydrogen peroxide near mitochondrial DNA
23	L1	64 nm	Turn on	520 /584nm	Spatially-Confined visualization of intracellular hydrogen

					peroxide
24	Mito-NIRHP	60 nm	Turn on	650/710 nm	Imaging H_2O_2 in *vitro* and in *vivo*
25	NP1	_	Turn on	_	Detection of cytoplasmic and nuclear hydrogen peroxide

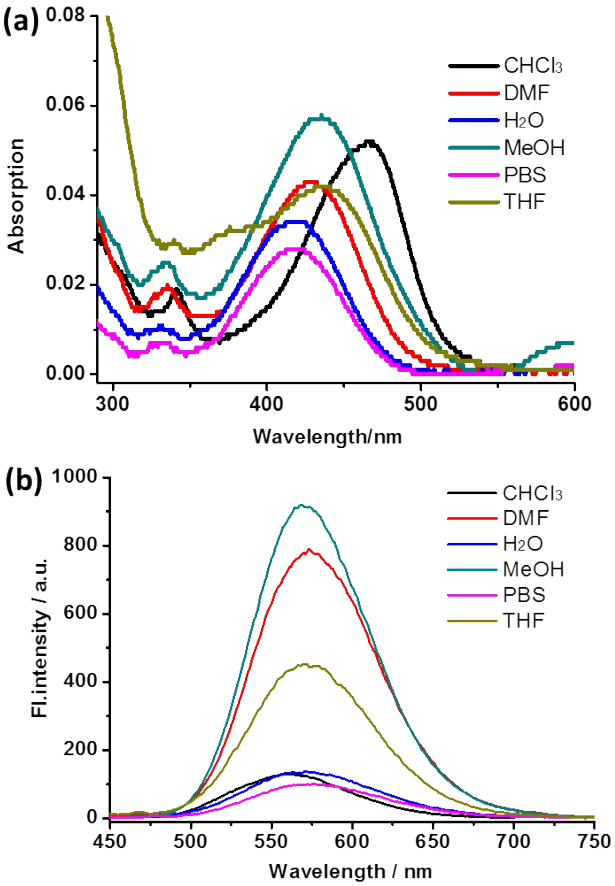

Fig S1. (a) UV-vis absorption (b) and fluorescence spectra of **CAI** in various solvents. Concentration of **CAI**: 2 μM.

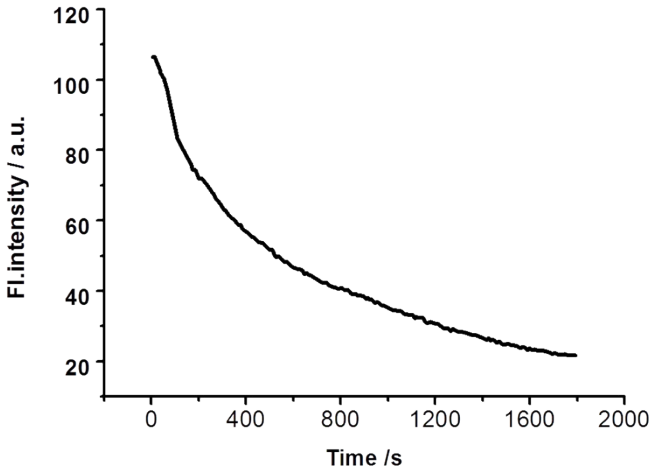

Fig S2. Time course of the fluorescence intensity of **CAI** (2 μM) at 575 nm after adding 80 equiv. H_2O_2. λ_{ex}= 405 nm.

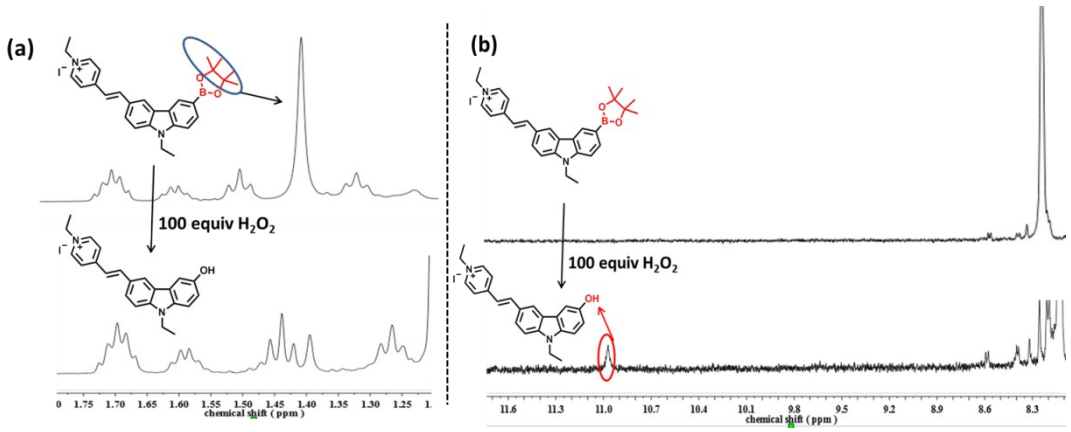

Fig S3. (a) The ^{1}H NMR spectrum of the methyl peak of **CAI** in the absence and presence of H_2O_2 (100 equiv) in d_6 - DMSO/D_2O (2:1); (b) The ^{1}H NMR spectrum of the hydroxy peak of **CAI** in the absent and present of H_2O_2 (100 equiv) in d_6 - DMSO/D_2O (2:1).

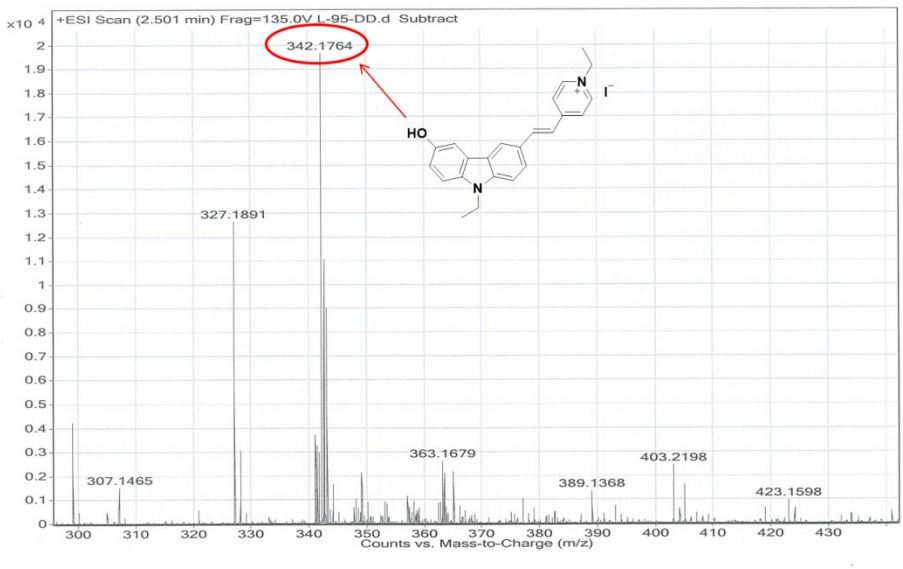

Fig S4. The formation of 1-ethyl-4-(2-(9-ethyl-6-hydroxy-9*H*-carbazol-3-yl)vinyl)pyridin-1-ium iodide from the reaction of the probe with H_2O_2 was confirmed by H RMS (ESI). The intense peak at m/z 342.1746 in the H RMS (ESI) spectrum corresponds to 1-ethyl-4-(2-(9-ethyl-6-hydroxy-9H-carbazol-3-yl)vinyl)pyridin-1-ium iodide.

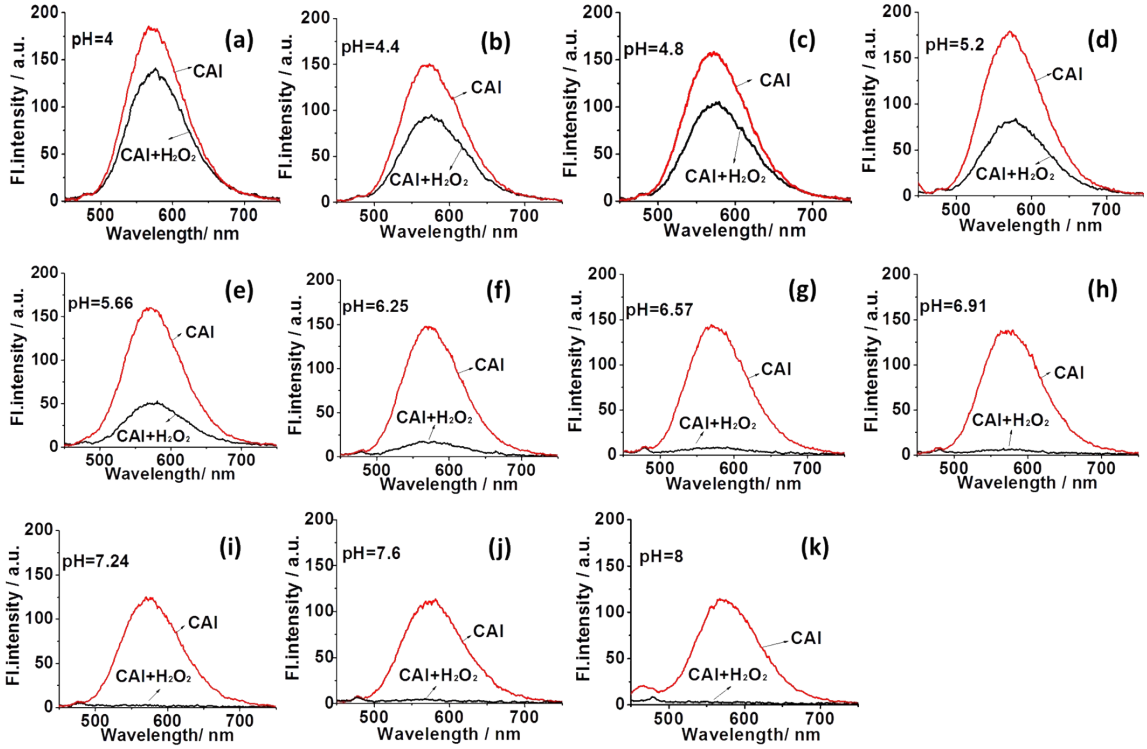

Fig S5. Fluorescent response of the probe **CAI** (2 μM) to H_2O_2 (110 equiv.) in different pH PBS buffer solution.

Table S2. Cytotoxicity data of **CAI** in RAW 264.7 cells [a] at 8 h.

Incubated concentration (μM)	0	5	15	20	30
(% cell survival)	100±4	96±4	77±4	71±4	62±4

[a] Cell viability was quantified by the MTT assays (mean ± SD).

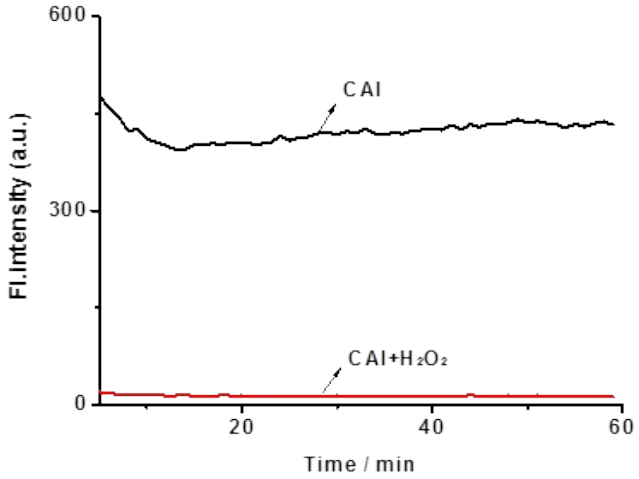

Fig S6. Photostbility of the probe **CAI** (2 μM) in the absence and presence of H_2O_2. λ_{ex} = 405 nm

Characterization

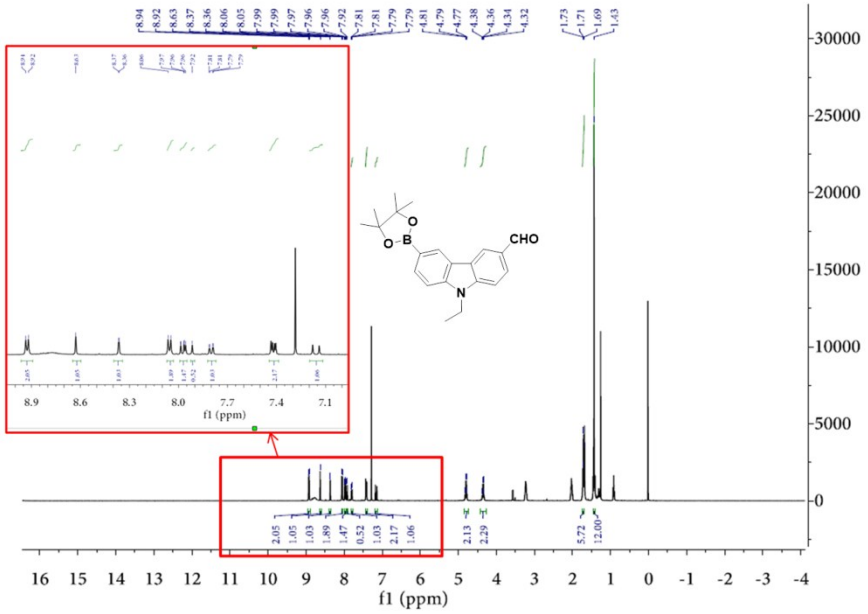

Fig S7. ^{1}H NMR spectrum of compound **2** in $CDCl_3$

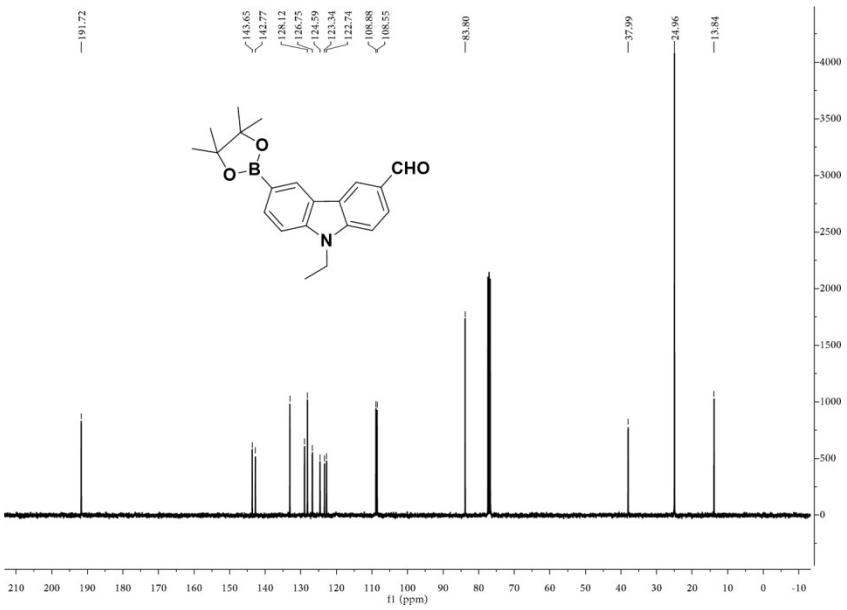

Fig S8. ^{13}C NMR spectrum of compound **2** in $CDCl_3$

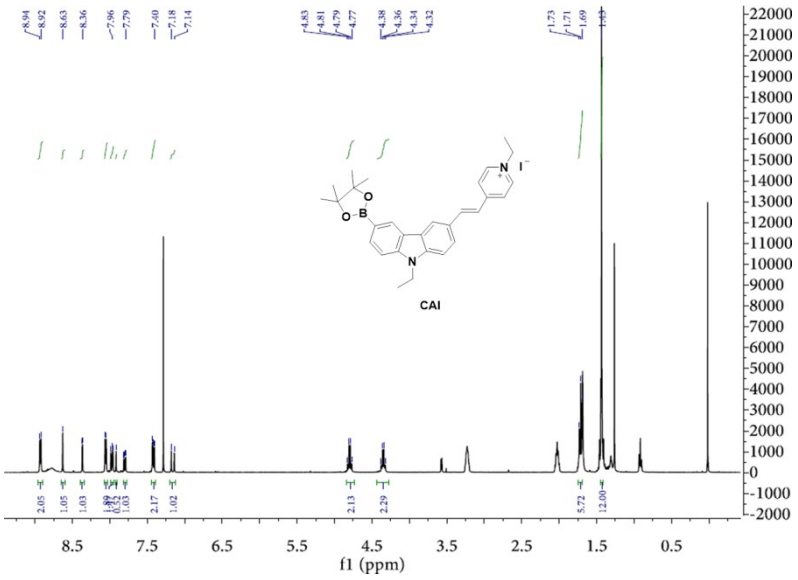

Fig S9. ^{1}H NMR spectrum of **CAI** in $CDCl_3$

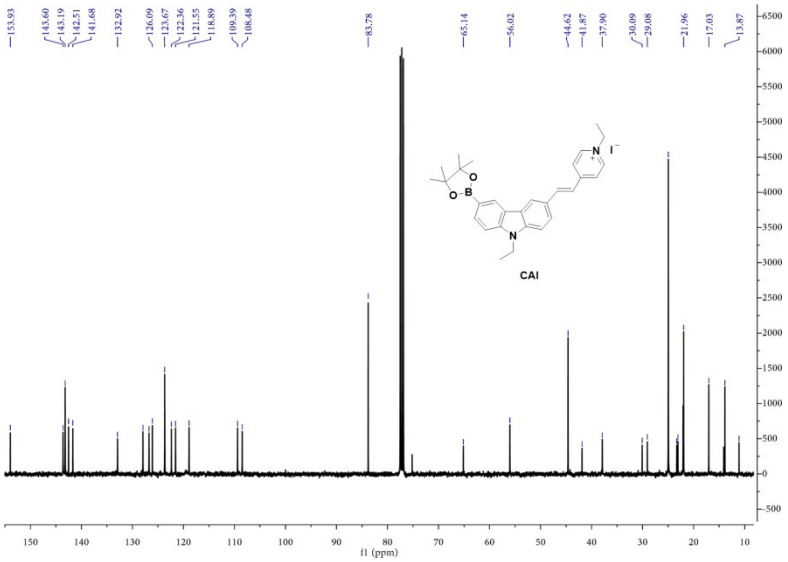

Fig S10. ^{13}C NMR spectrum of **CAI**

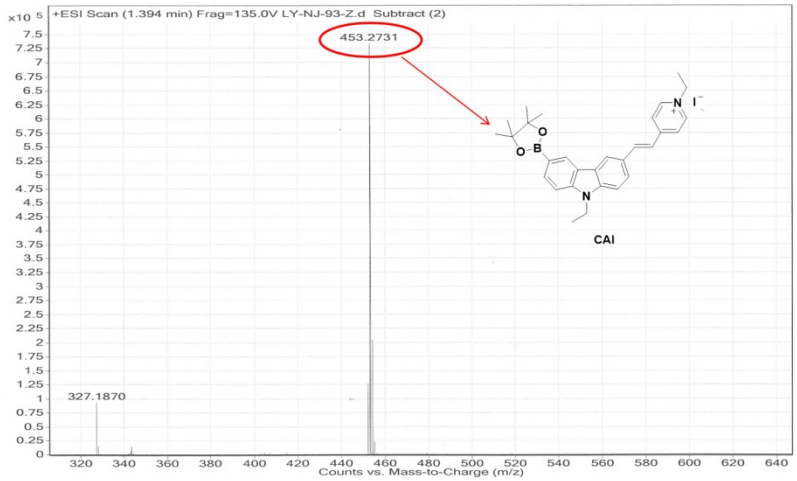

Fig S11. High resolution mass spectrum (HRMS) (ESI) of **CAI**

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