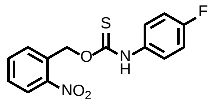
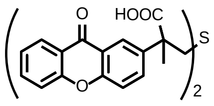
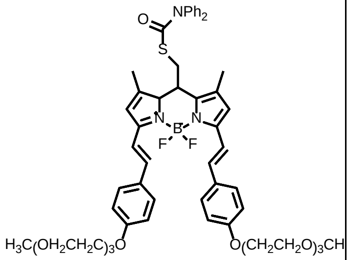
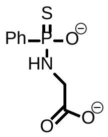
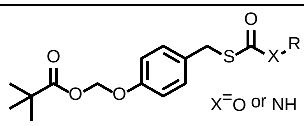
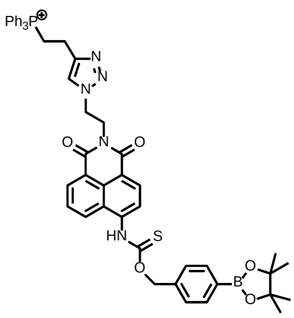
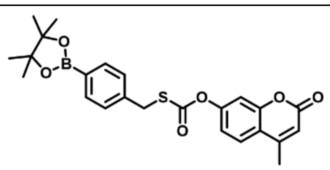
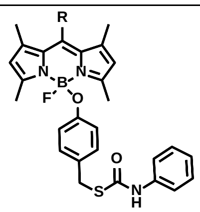
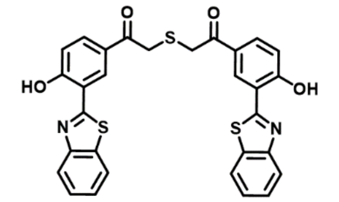
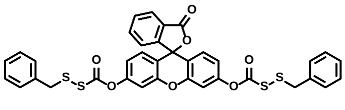
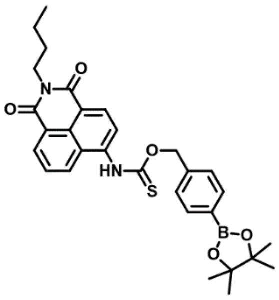
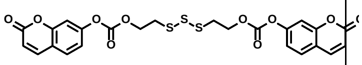
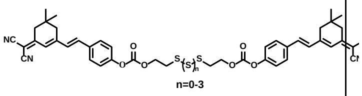
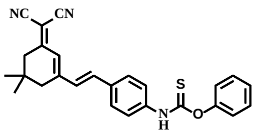
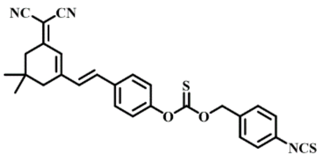
Table S1. Summary of activatable H_2S donors.

Fluorescent H_2S donors	Activation type	Optical parameters	H_2S detecting method	H_2S releasing efficiency	Ref
	UV Light (365 nm)	-	Methylene blue assay	[a]N.F.	*Org. Lett.* **2017**, *19*, 2278−2281
	UV Light (325–385 nm)	-	Methylene blue and HSip-1 assay	N.F.	*Bioorg. Med. Chem. Lett.* **2015**, *25*, 175−178
	VIS-NIR (700 nm)	$\lambda_{ex/em}$= 688/779 nm	Methylene blue and SF7-AM assay	48%	*Org. Lett.* **2018**, *20*, 4907−4911
	pH	-	Methylene blue assay	N.F.	*J. Am. Chem. Soc.* **2016,** *138*, 6336−6339
	Esterase	-	Dn-N3-based assay	N.F.	*Org. Lett.* **2017**, *19*, 62−65
	ROS	$\lambda_{ex/em}$= 405/540 nm	Methylene blue assay	N.F.	*ACS Sens.* **2020,** *5*, 319−326
	ROS	$\lambda_{ex/em}$= 365/448 nm	Methylene blue assay	N.F.	*Tetrahedron Lett.* **2021,** *69*, 152944
	Visible-Light (λ=470 nm)	$\lambda_{ex/em}$= 470/540 nm	Methylene blue and H_2S-sensitive electrode assay	30%~40%	*Org. Lett.* **2017**, *19*, 4822−4825

	UV-Vis light (λ>410 nm)	From green ($\lambda_{ex/em}$=350/517 nm)to blue ($\lambda_{ex/em}$=350/450 nm)	Coumarin-hemicyanine fluorescence dye and methylene blue assay	N.F.	*Chem. Commun.* **2018**, *54*, 3106
	Cys	$\lambda_{ex/em}$= 490/520 nm	Methylene blue assay	75%	*Chem. Sci.* **2019**, *10*,1873−1878
	ROS	$\lambda_{ex/em}$= 405/577 nm	Methylene blue assay	N.F.	*Chem. Sci.* **2019,** *10*, 7690−7694
	Biothiol	$\lambda_{ex/em}$= 332/446 nm	Fluorescent probe NAP-1 and methylene blue assay	N.F.	*Chem. Commun*. **2020**, *56*, 7769−7772
	Thioredoxin reductase	$\lambda_{ex/em}$= 580/670 nm	Fluorescent probe WSP-2 and methylene blue assay	N.F.	*J. Mater. Chem. B* **2022**, *10*, 2183−2193
	Cys	$\lambda_{ex/em}$= 470/660 nm	H_2S fluorescent probe C-7AZ	62%	*Anal. Chem.* **2021**, *93*, 4894−4901
	Biothiols	$\lambda_{ex/em}$= 530/666 nm	H_2S fluorescent probe C-7AZ and methylene blue assay	72.9%	**This work**

[a]N.F. means “Not Find”.

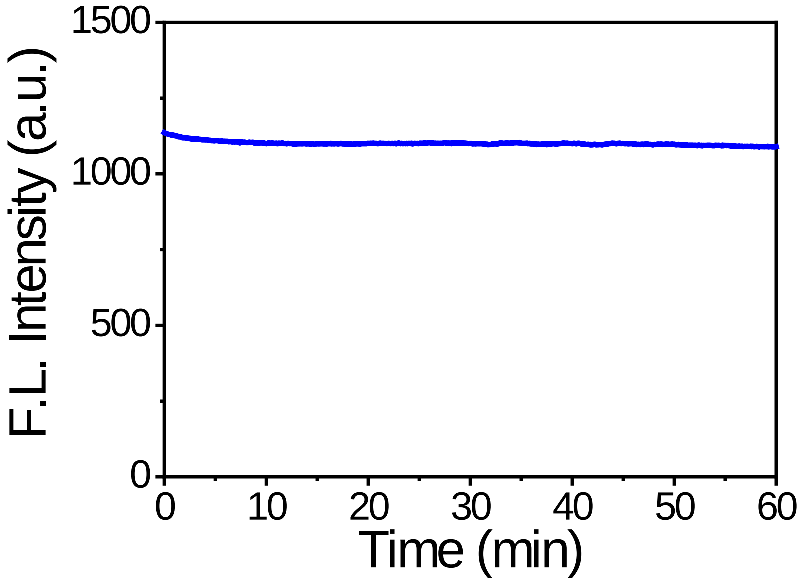


Figure R1. Fluorescence intensity of TCOO (10 μM) as a function of time.

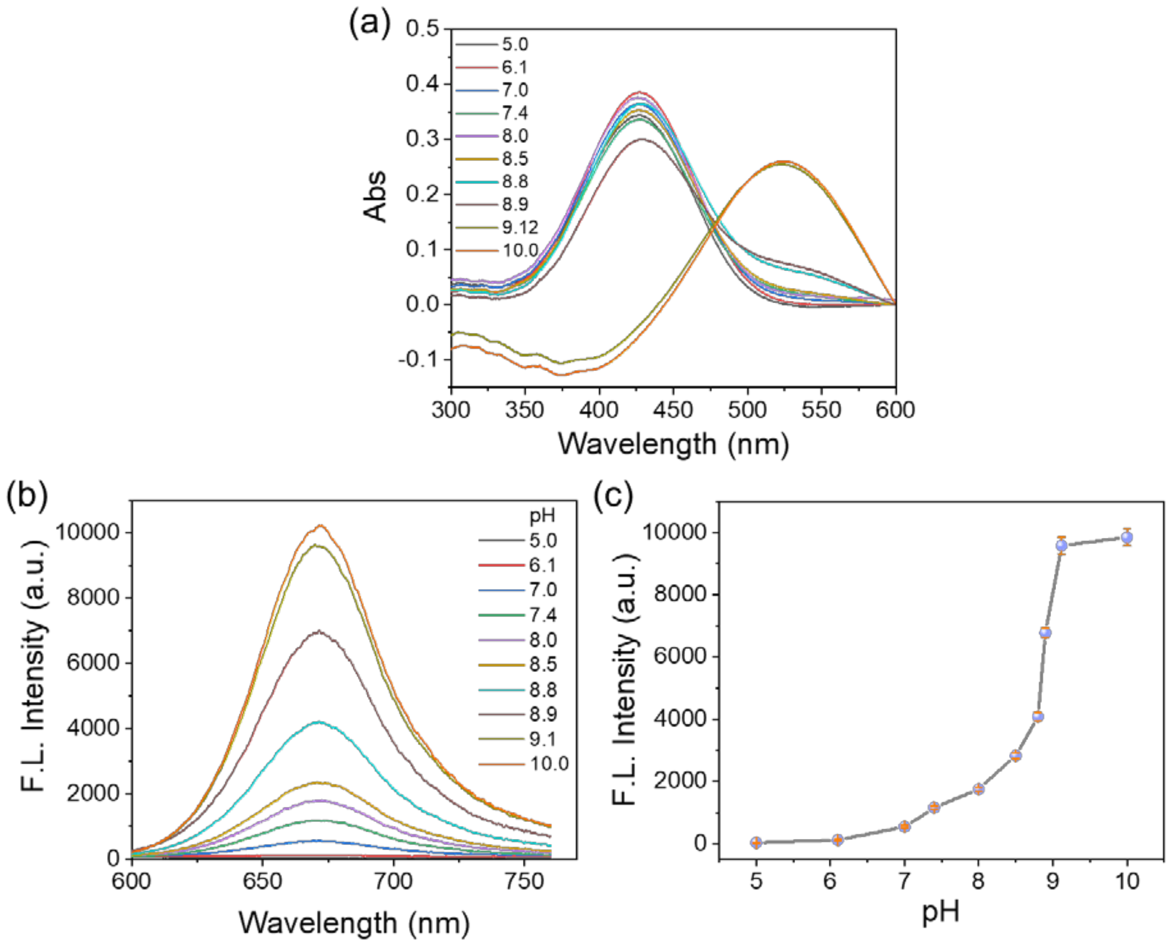


Figure R2. Absorption spectrum (a) and fluorescence spectrum (b) of TCOO (10 μM) at various pH values. (c) Fluorescence intensity of **TCOO** at 666 nm as a function of pH. Conditions: DMF/PBS (20 mM, *v/v*, 3/7) at 37 ^{o}C for 30 min.

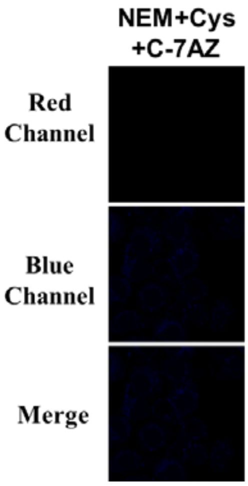


Figure R3. Confocal fluorescence images in RAW 246.7 cells. NEM-pretreated Cells were incubated with Cys (200 μM) for 30 min and then with C-7AZ (3 μM) for 30 min. Red channel: λ_{ex}=514 nm, λ_{em}=660±30 nm; blue channel: λ_{ex}=405 nm, λ_{em}=450±20 nm.

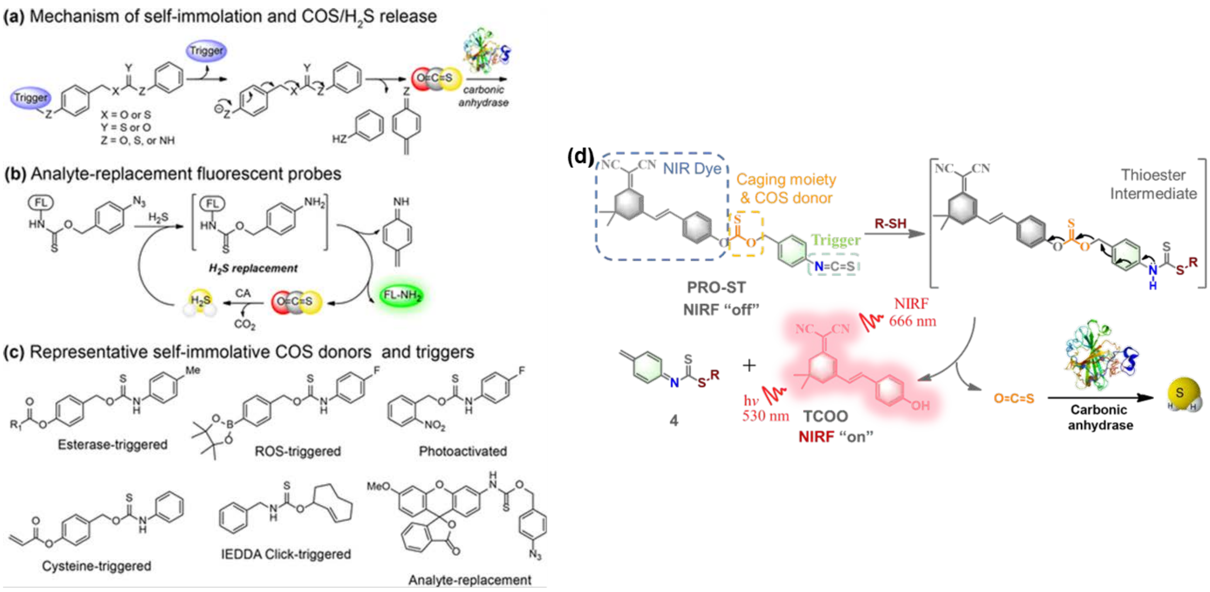


Figure R4. (a) Mechanism of self-immolation and subsequent conversion of COS to H_2S by CA. (b) Development of analyte-replacement fluorescent probes. (c) Current examples of self-immolation-based COS/H_2S donors. (d) This work.