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

Detection of lipase activity in human serum based on a ratio fluorescent probe

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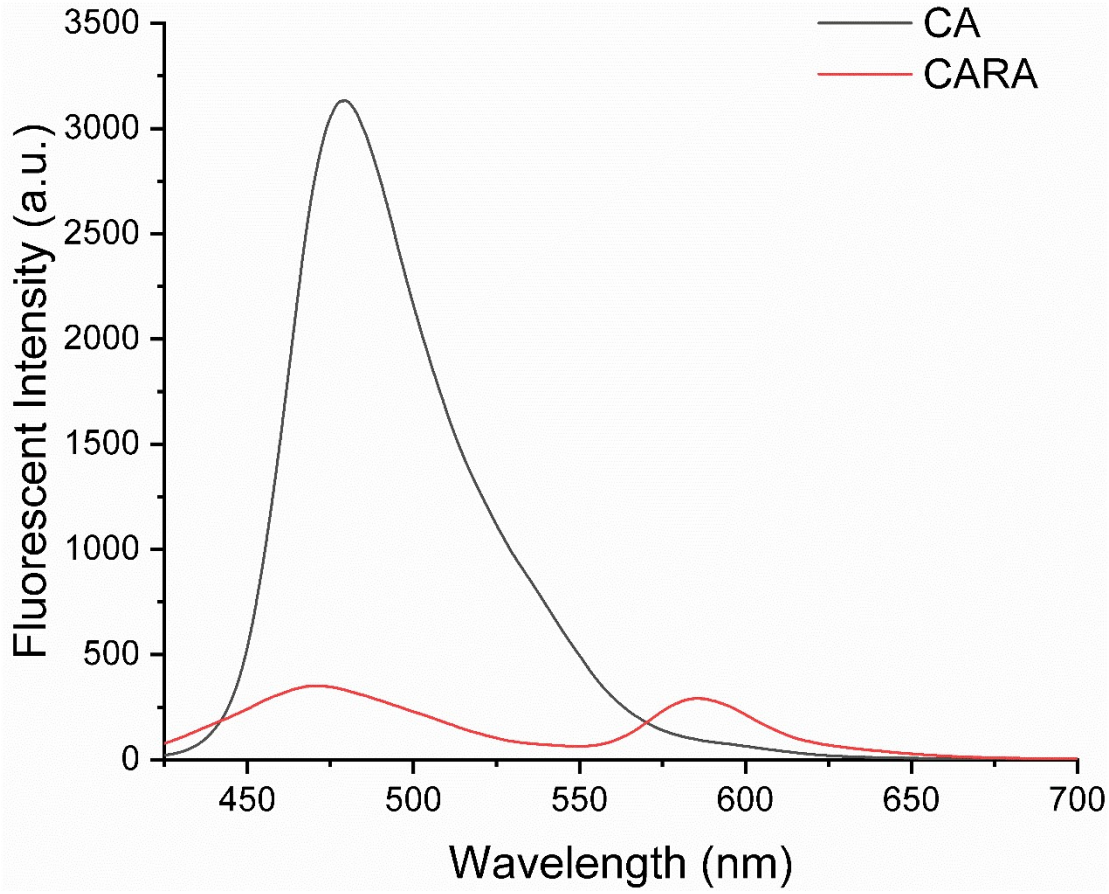


Fig. S1. Fluorescent emission spectra of CA (10 μM) and CARA (10 μM) with excitation at 405 nm. FRET efficiency = ($I_{CA(470\ nm)}$ - $I_{CARA(470\ nm)}$) / $I_{CA(470\ nm)}$ × 100% = 88.8%. $I_{CA(470\ nm)}$ represents the fluorescent intensity of CA at 470 nm with excited at 405 nm, $I_{CARA(470\ nm)}$ represents the fluorescent intensity of CARA at 470 nm with excited at 405 nm.

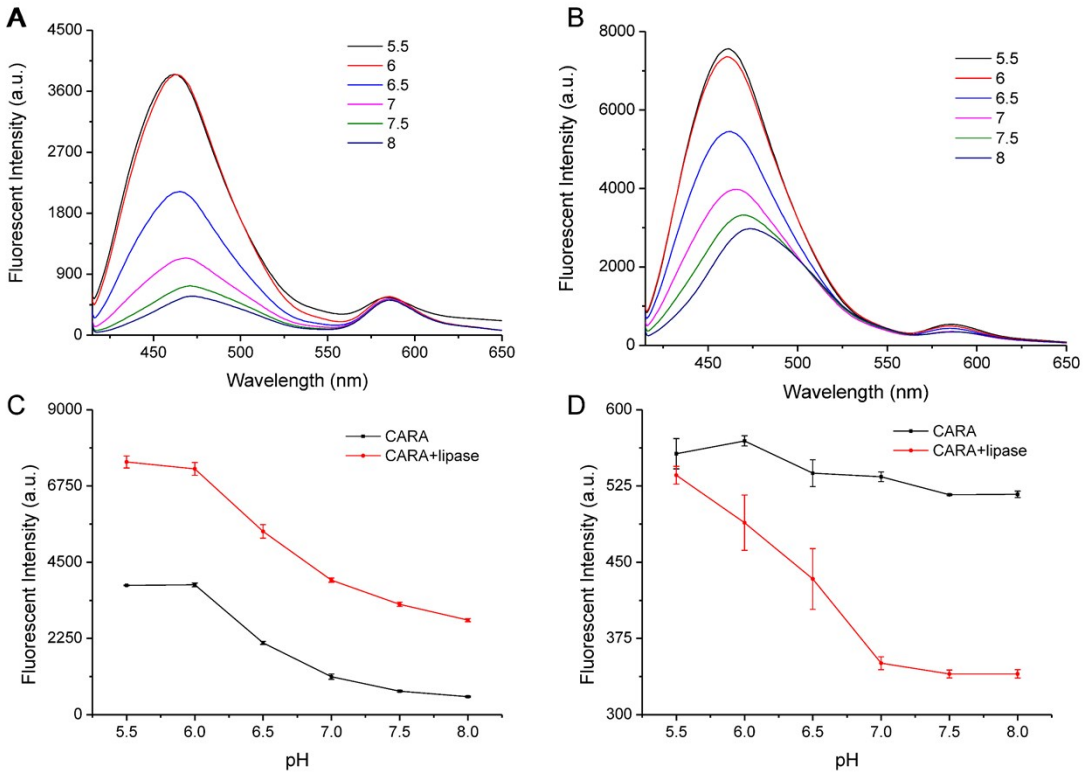


Fig. S2. The fluorescent spectra of CARA in the absence (A) or presence (B) of lipase at pH values ranging from 5.5 to 8.0. The fluorescent intensity of CARA (the black line) and CARA + lipase (the red line) at 470nm (C) and 585nm (D).

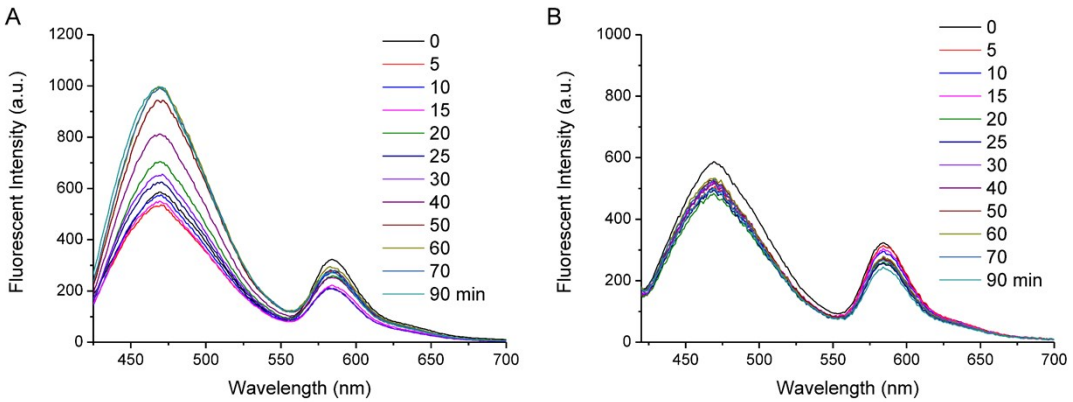


Fig. S3. The fluorescent spectra of CARA (10 μM) in the presence (A) or absence (B) of lipase in PBS (pH 7.2) at 37 °C for 0-90 min, which were got at 0, 5, 10, 15, 20 ,25 ,30 ,40 ,50, 60, 70, 90 minutes.

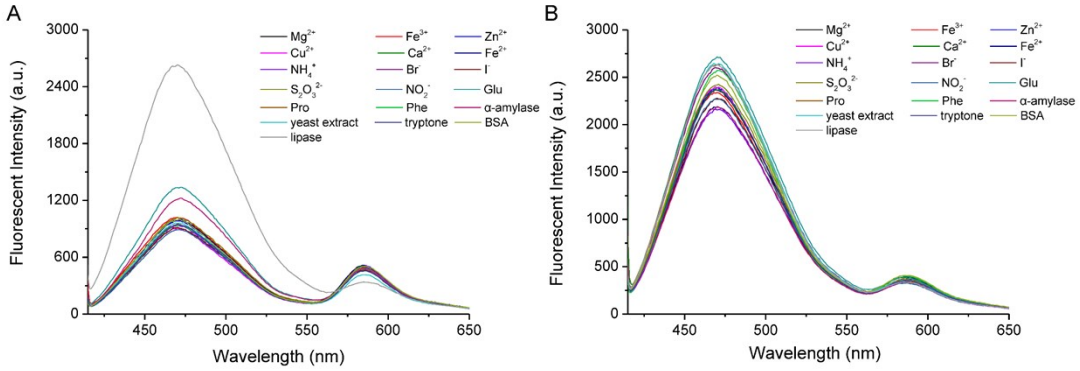


Fig. S4. (A) Fluorescent spectra of CARA (10 μM) toward lipase and other biological substances including Mg^{2+}, Zn^{2+}, Br^-, Cu^{2+}, Fe^{2+}, NO_2^-, Fe^{3+}, Ca^{2+}, NH_4^+, $S_2O_3^{2-}$, I^-, Phe, Pro, Glu, α-amylase, tryptone, yeast extract, BSA in PBS (pH 7.2). (B) Fluorescent spectra of CARA (10 μM) toward coexistence of lipase and other biological substances including Mg^{2+}, Zn^{2+}, Br^-, Cu^{2+}, Fe^{2+}, NO_2^-, Fe^{3+}, Ca^{2+}, NH_4^+, $S_2O_3^{2-}$, I^-, Phe, Pro, Glu, α-amylase, tryptone, yeast extract, BSA in PBS (pH 7.2).

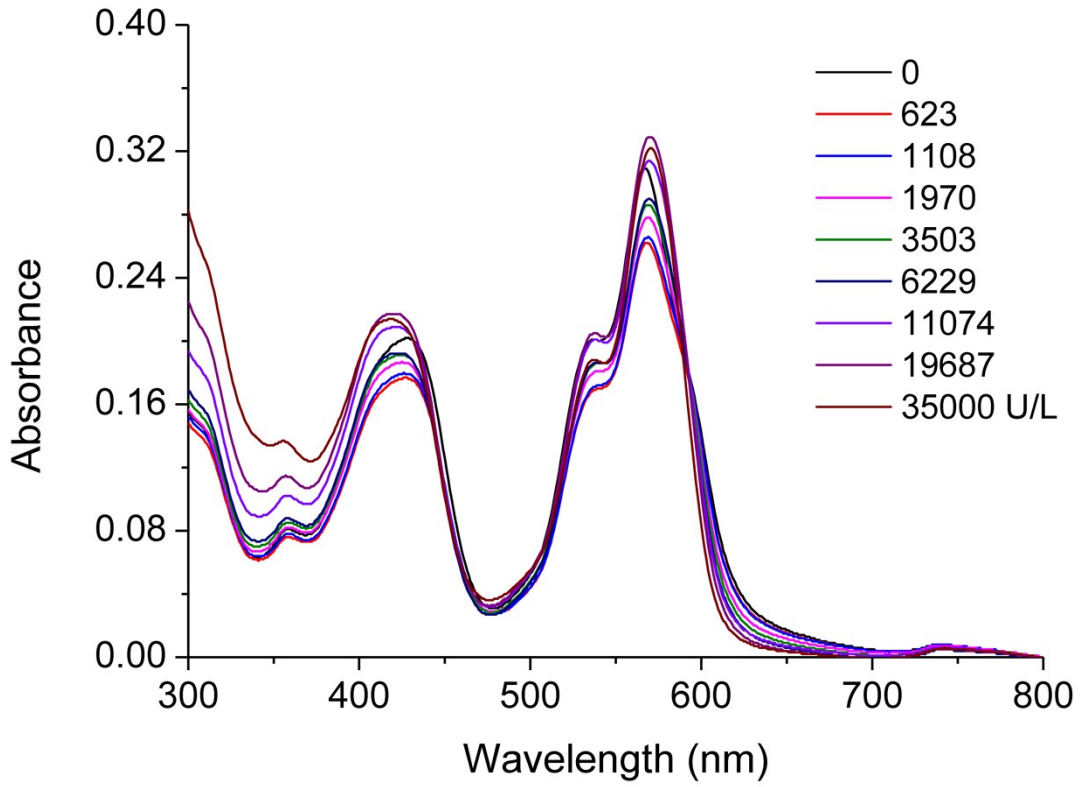


Fig. S5. The UV spectra of CARA (10 μM) with different concentrations of lipase in PBS (pH 7.2).

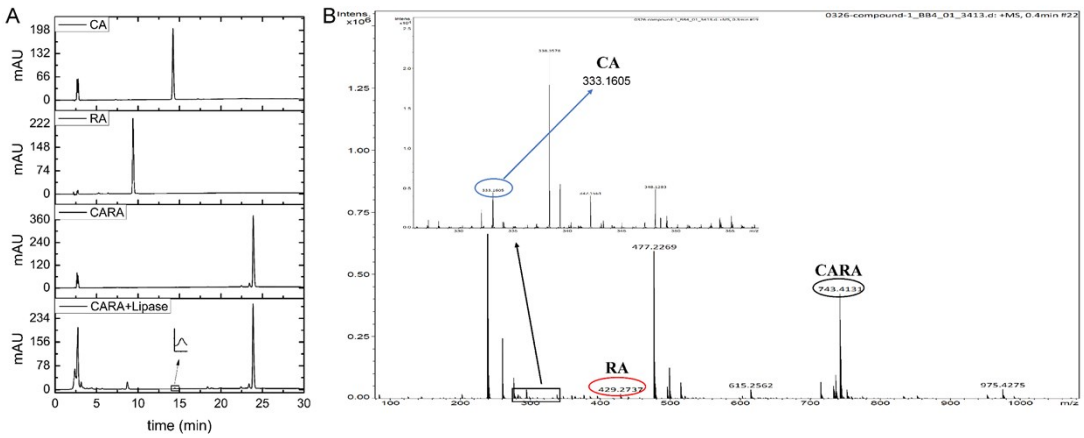


Fig. S6. HPLC (A) and HRMS (B) for the response mechanism of CARA to lipase analysis.

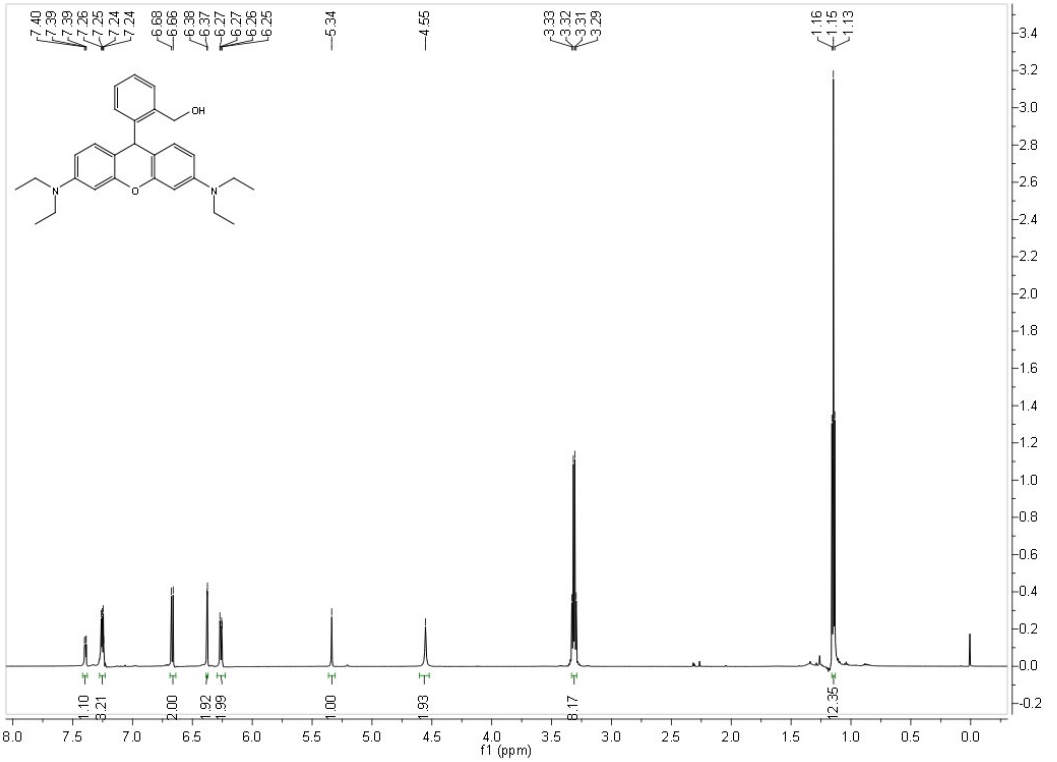
Table S1. Comparison of some sensors based on fluorometric and colorimetric methods for the analysis of lipase activity.

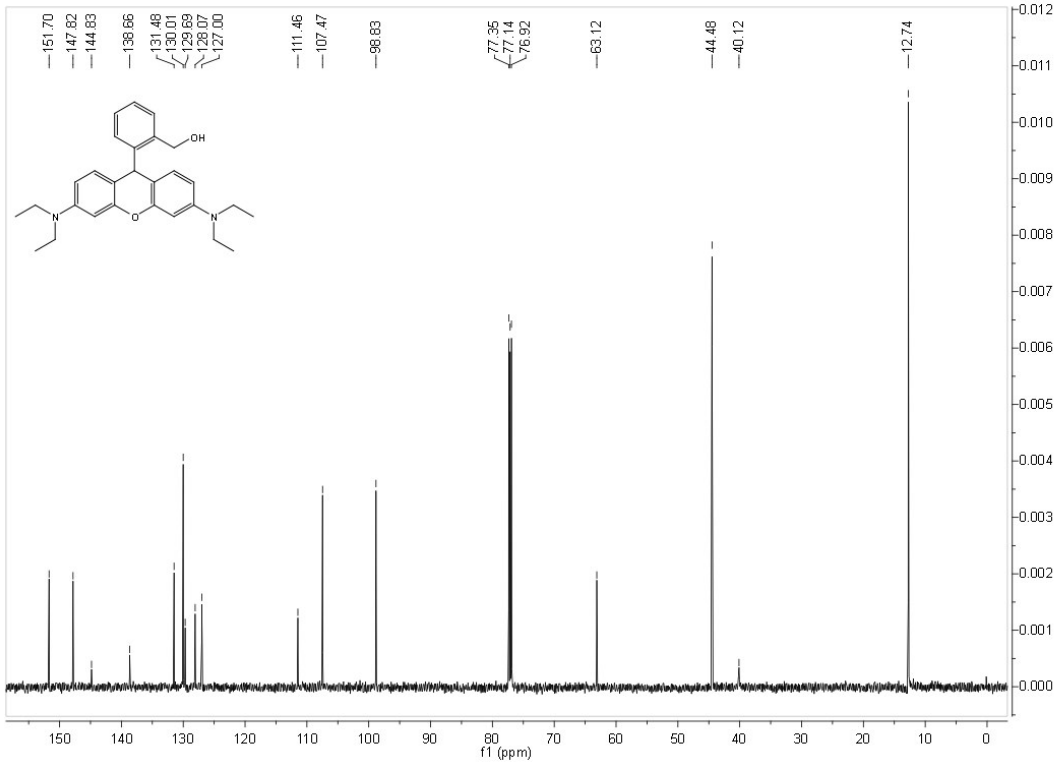
Fluorescent probe	Ex/Em	Test Solvent System	Reference
Quantum dots and the proximal substrate's dye	430/520, 573	The aqueous assay buffer containing 10% v/v DMSO	1
CPP	550/670	PBS/DMSO (v/v=1:1)	2
TPE-c-CD and TPE-H	390/460	The PBS buffer containing DMSO	3
P1 (TPE derivative)	350/425	Hexane/PBS(v/v=1:1)	4
S1 (TPE derivative)	390/453	Hexane/PBS (v/v=1:1)	5
dinitrophenylamino group pyrenebutyric acid monoesters	300/376	The PBS buffer containing 30% v/v DMSO	6
This work	405/470, 585	The PBS buffer containing 1% v/v DMSO	

Reference:

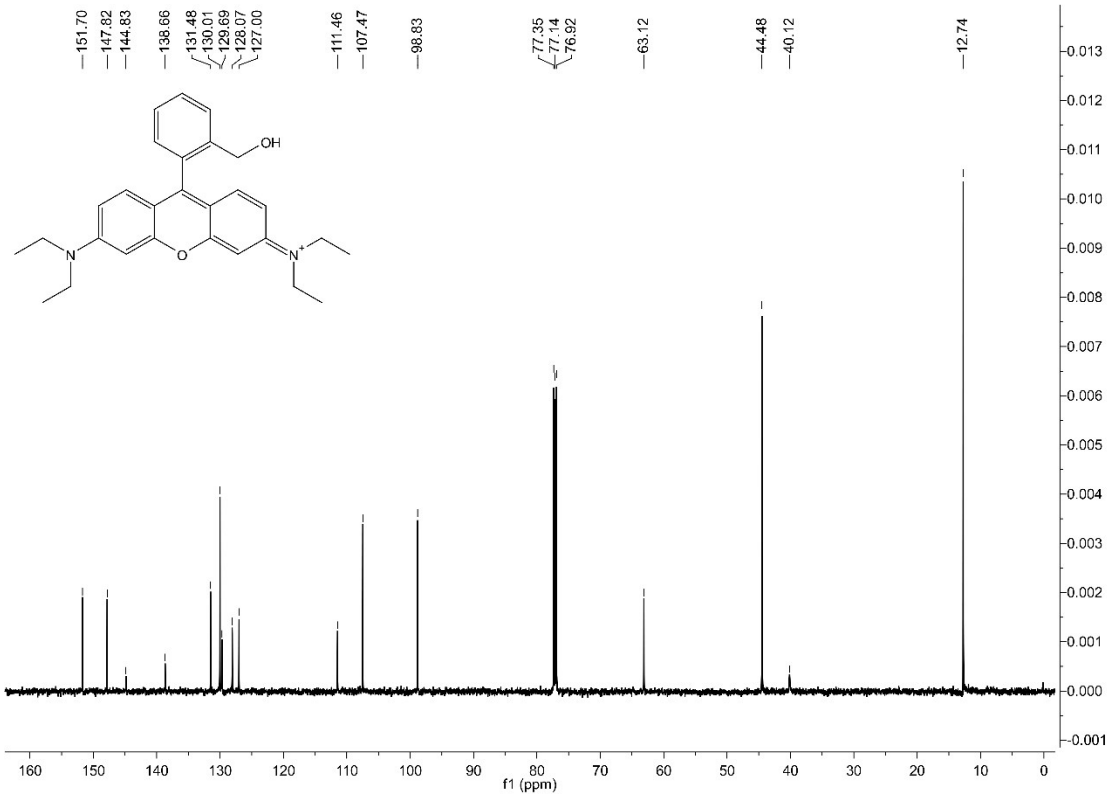
1. J. C. Breger, K. Susumu, G. Lasarte-Aragones, S. A. Diaz, J. Brask and I. L. Medintz, *ACS sensors*, 2020, **5**, 1295-1304.
2. Z. Qiao, H. Zhang, Y. Zhang and K. Wang, *iScience*, 2020, **23**, 101294.
3. J. Shi, Q. Deng, Y. Li, Z. Zheng, H. Shangguan, L. Li, F. Huang and B. Tang, *Chemical communications*, 2019, **55**, 6417-6420.
4. J. Shi, S. Zhang, M. M. Zheng, Q. C. Deng, C. Zheng, J. Li and F. H. Huang, *Sensor Actuat B-Chem*, 2017, **238**, 765-771.
5. J. Shi, Q. C. Deng, C. Y. Wan, M. M. Zheng, F. H. Huang and B. Tang, *Chemical Science*, 2017, **8**, 6188-6195.
6. Y. Yang, P. Babiak and J.-L. Reymond, *Org Biomol Chem*, 2006, **4**, 1746-1754.

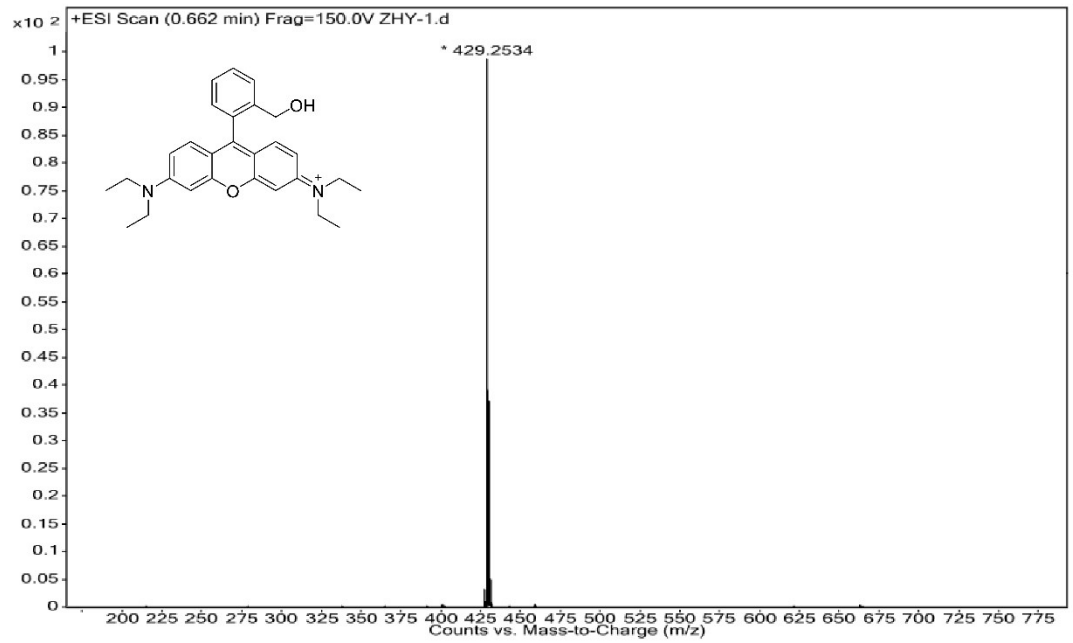
The NMR and HR-MS spectra






7.40
7.39
7.39
7.26
7.25
7.24
6.68
6.66
6.38
6.37
6.27
6.27
6.26
6.25
5.34
4.55
3.33
3.32
3.31
3.29
1.16
1.15
1.13
0.01
OH
N
O
N+
1.00
3.02
1.89
2.09
1.87
0.93
1.76
8.03
12.00
f1 (ppm)


151.70
147.82
144.83
138.66
131.48
130.01
129.69
128.07
127.00
111.46
107.47
98.83
77.35
77.14
76.92
63.12
44.48
40.12
12.74
OH
N
O
N+
f1 (ppm)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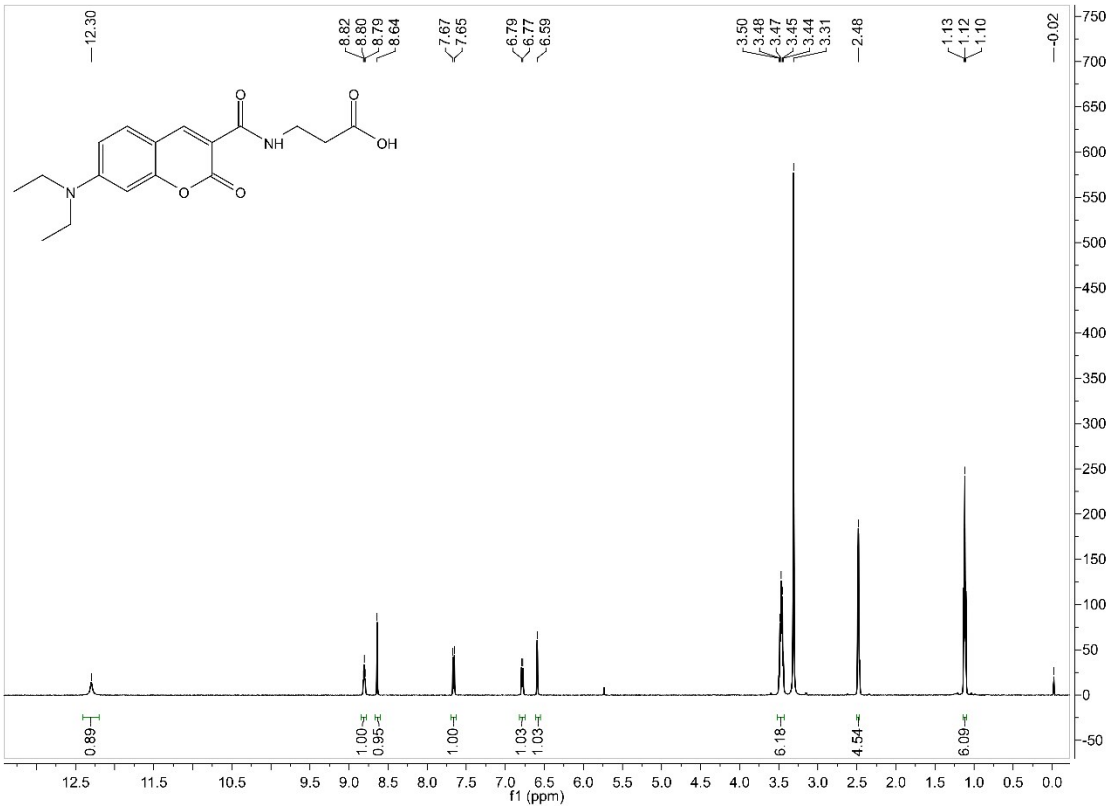
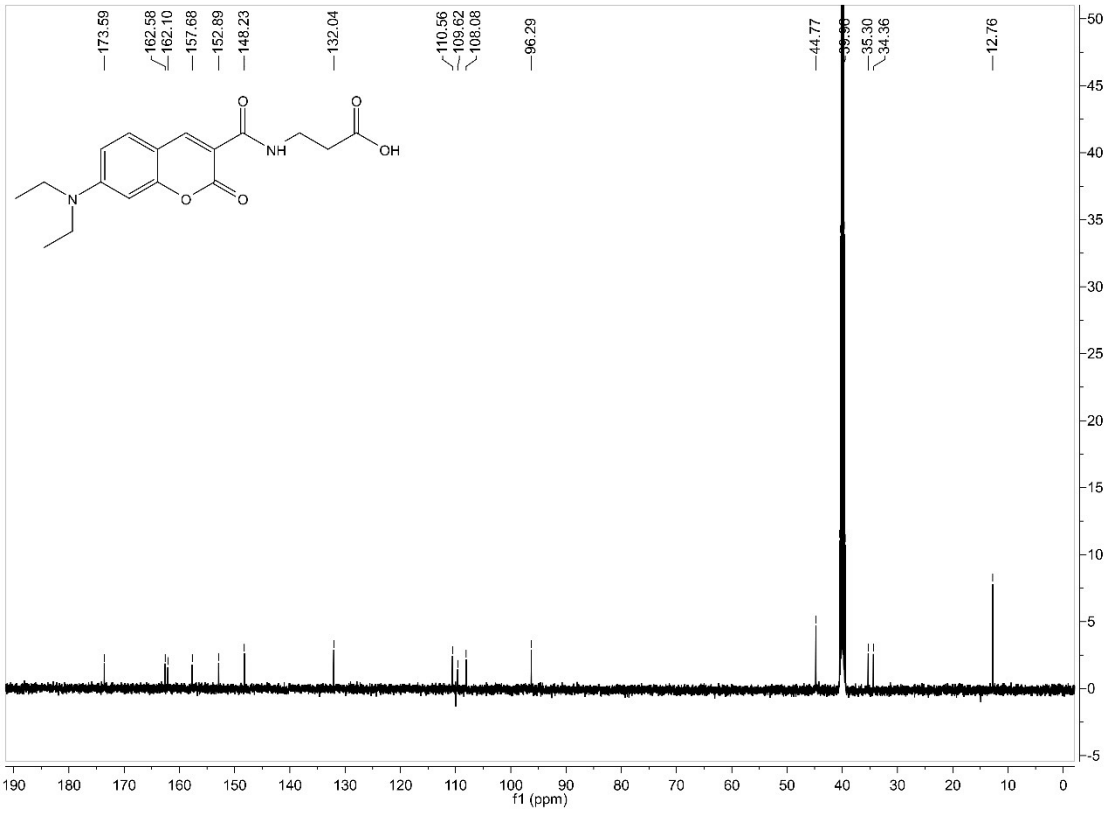
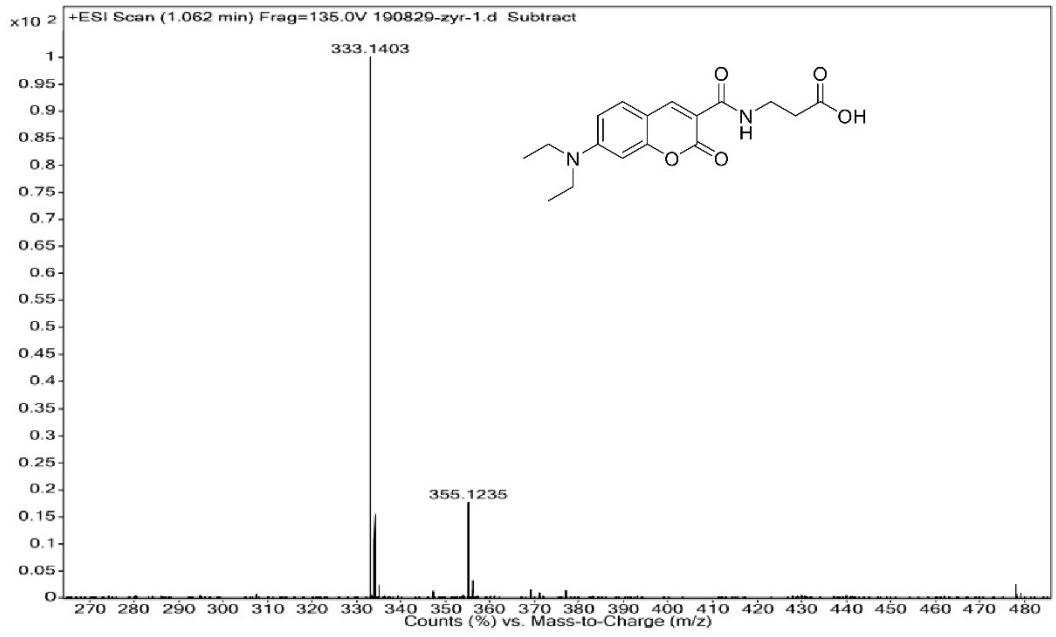
* 429.2534
OH
N
O
N
Counts vs. Mass-to-Charge (m/z)


12.30
8.82
8.80
8.79
8.64
7.67
7.65
6.79
6.77
6.59
3.50
3.48
3.47
3.45
3.44
3.31
2.48
1.13
1.12
1.10
-0.02
O
NH
OH
N
O
O
0.89
1.00
0.95
1.00
1.03
1.03
6.18
4.54
6.09
f1 (ppm)


173.59
162.58
162.10
157.68
152.89
148.23
132.04
110.56
109.62
108.08
96.29
44.77
38.86
35.30
34.36
12.76
NH
OH
O
N
f1 (ppm)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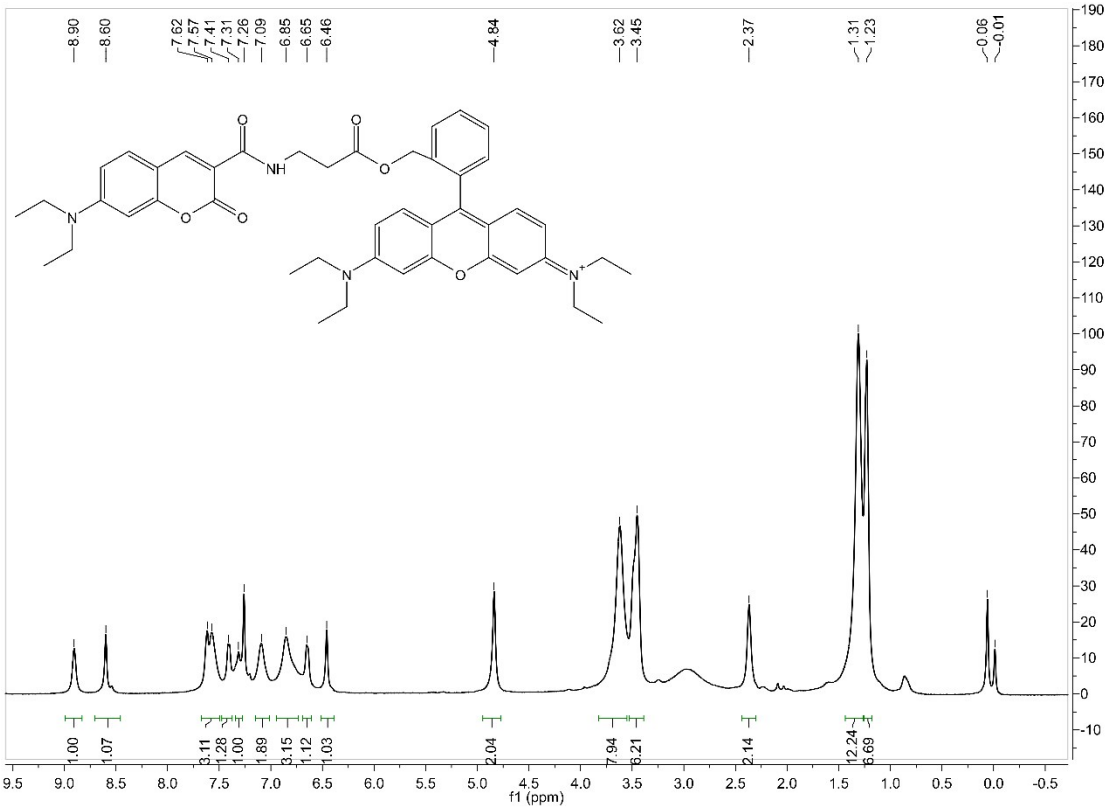
333.1403
355.1235
NH
OH
Counts (%) vs. Mass-to-Charge (m/z)


8.90
8.60
7.62
7.57
7.41
7.31
7.26
7.09
6.85
6.65
6.46
4.84
3.62
3.45
2.37
1.31
1.23
0.06
-0.01
1.00
1.07
3.11
1.28
1.00
1.89
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1.12
1.03
2.04
7.94
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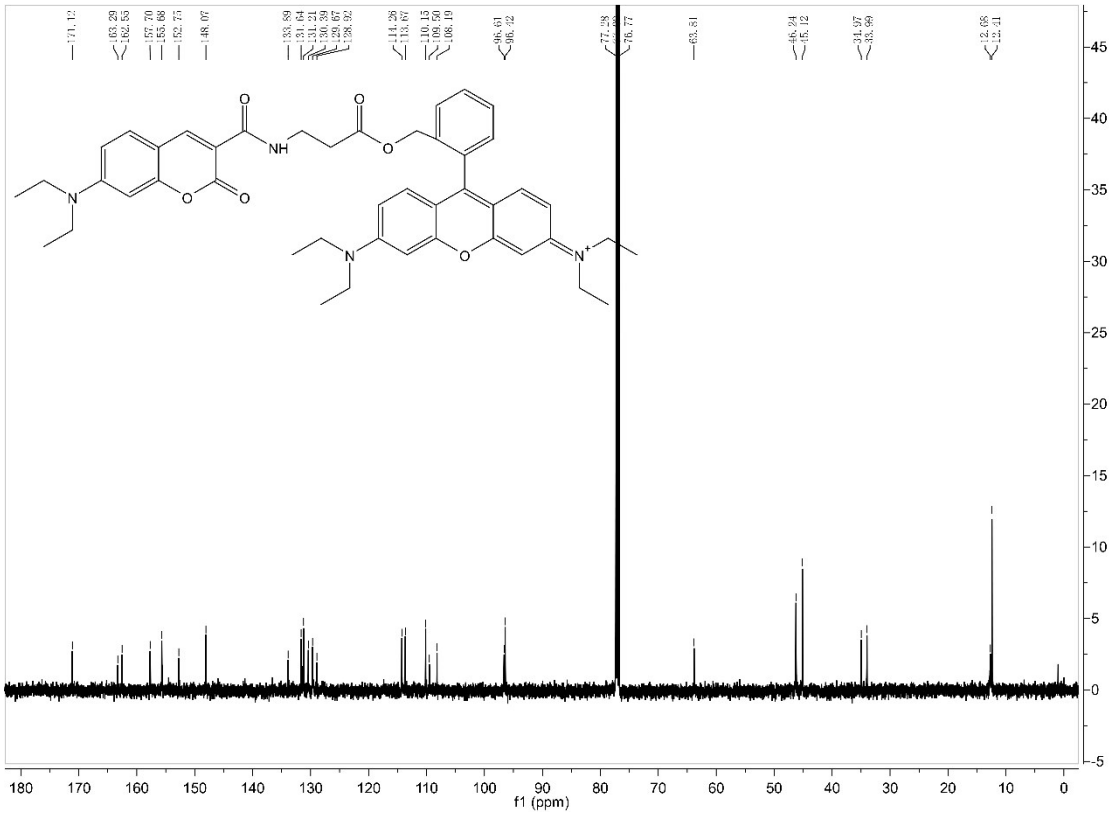
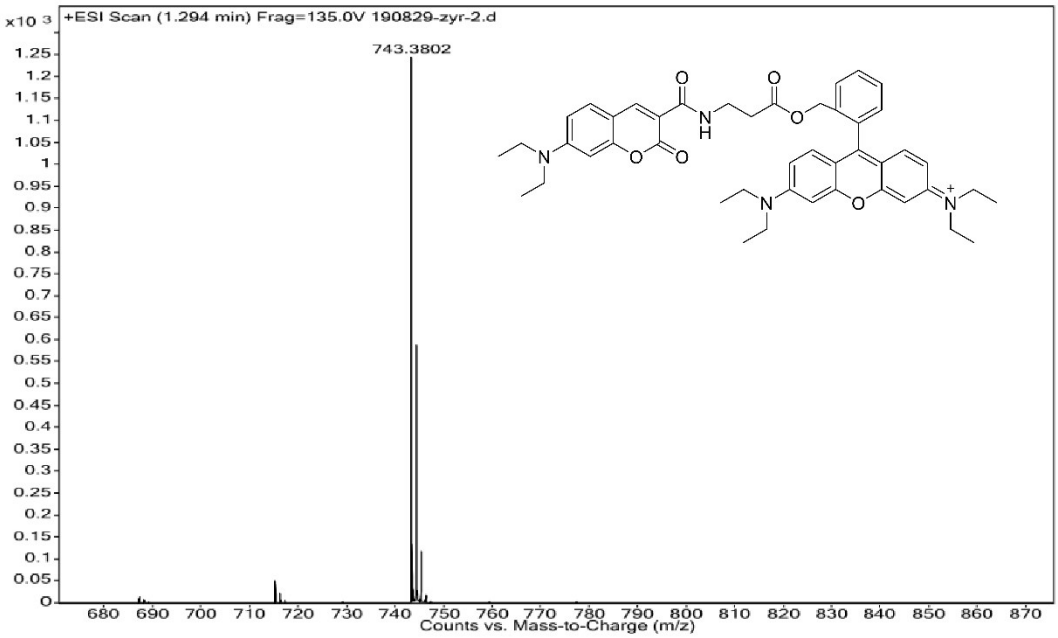
2.14
12.24
6.69
f1 (ppm)


f1 (ppm)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x10 3
743.3802
Counts vs. Mass-to-Charge (m/z)