Electronic Supplementary Material (ESI) for Analytical Methods.

Supporting Information

Two Fe(Ⅲ)/Eu(Ⅲ) Salophen complex-based optical sensors for determination of organophosphorus pesticides monocrotophos

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Fig. S1† 1H NMR spectra (400 MHz) of (a) I-N-Sal, (b) Salophen in DMSO and (c) N-5-AF in $CDCl_3$.

Fig. S2† The FT-IR spectra of (a) I-N-Sal, (b) Sigel-NH_2, (c) Salophen, and (d) N-5-AF.

Fig. S3† The UV-vis spectra of Salophen and Salophen-Eu^{3+} in DMSO.

Fig. S4† Optimization of experimental conditions of I-N-Sal reaction with MP. (a) pH, (b) I-N-Sal concentration, (c) Reaction time.

Fig. S5† Effect of Salophen and Sigel-NH_2 (a) mass ratio and (b) reaction time on the absorbance spectra.

Fig. S6† Effect of pH on the combination reaction of $Eu^{3+}$with Sigel-NH_2-Salophen particles.

Fig. S7† Effect of (a) the mass of ESS particles, (b) Ph, (c) reaction time on the combination reaction of MP with ESS particles.

Fig. S8† Effect of (a) the pH, (b) reaction time on the combination reaction of N-5-AF with ESS-MP particles.

Fig. S9† Effect of eluents on the elute N-5-AF-MP from particles.

Fig. S10† The change of RLS intensity of I-N-Sal interacting with different pesticides.

Fig. S11† (a)The fluorescent spectra of ESS/N-5-AFwith different pesticides. (b) A competitive binding assay with ESS/N-5-AFwith different pesticides.

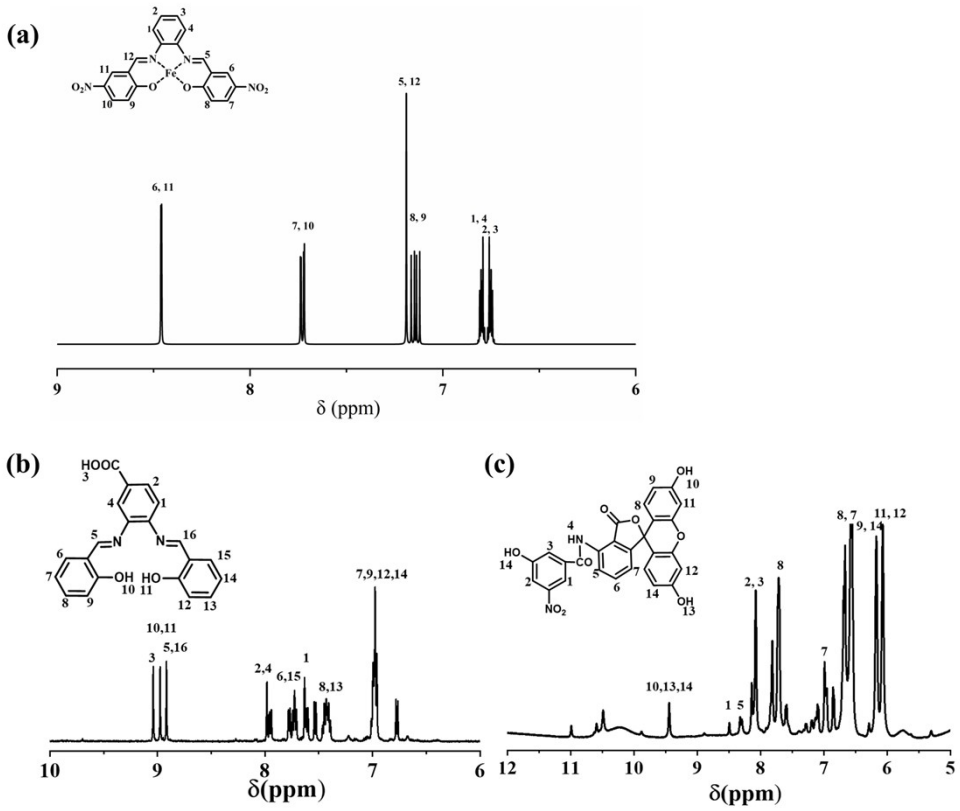
Fig. S12† The possible coordination patterns between the sensor I-N-Sal and MP at the B3LYP/6–31G(d) level

Fig. S13† The optimized molecular structure of I-N-Sal, MP and I-N-Sal + MP

Table S1† Comparison of the proposed I-N-Sal and ESS/N-5-AFsensors with the previously reported sensors.

Table S2† The RLS analytical results of real samples in different tap water and camellia oil (n = 6).

Table S3† The fluorescent analytical results of real samples in different tap water and camellia oil (n = 6).



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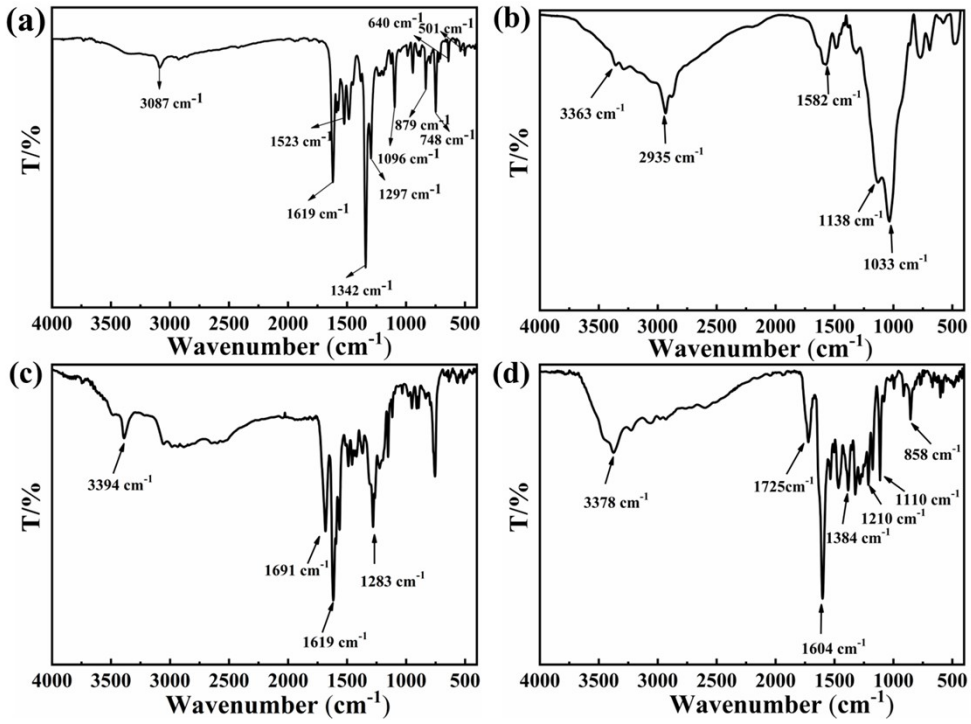


Fig. S2† The FT-IR spectra of (a) I-N-Sal, (b) Sigel-NH_2, (c) Salophen, and (d) N-5-AF.

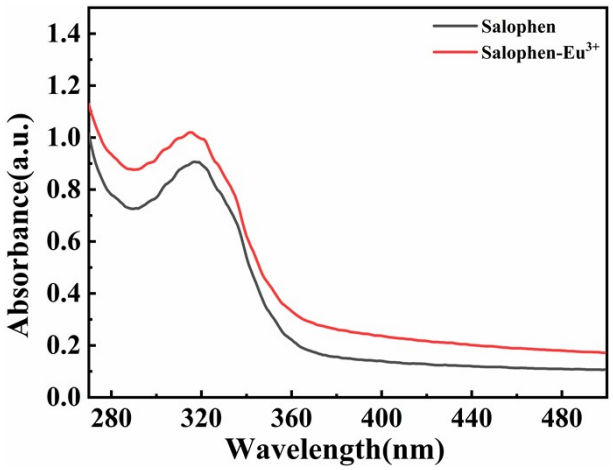


Fig. S3† The UV-vis spectra of Salophen and Salophen-Eu^{3+} in DMSO.

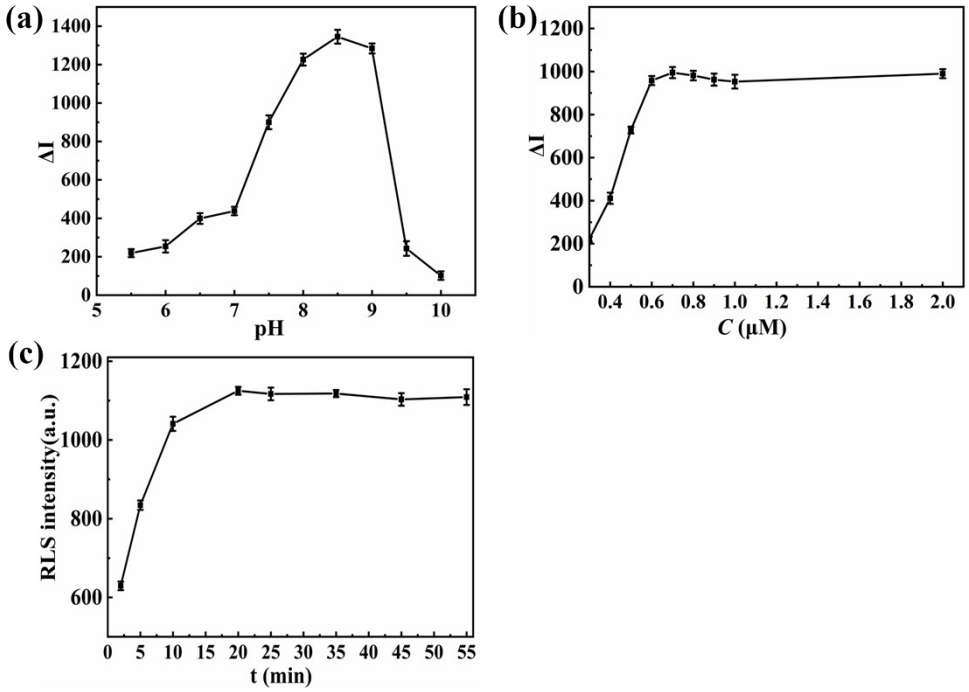


Fig. S4† Optimization of experimental conditions of I-N-Sal reaction with MP. (a) pH, (b) I-N-Sal concentration, (c) Reaction time.

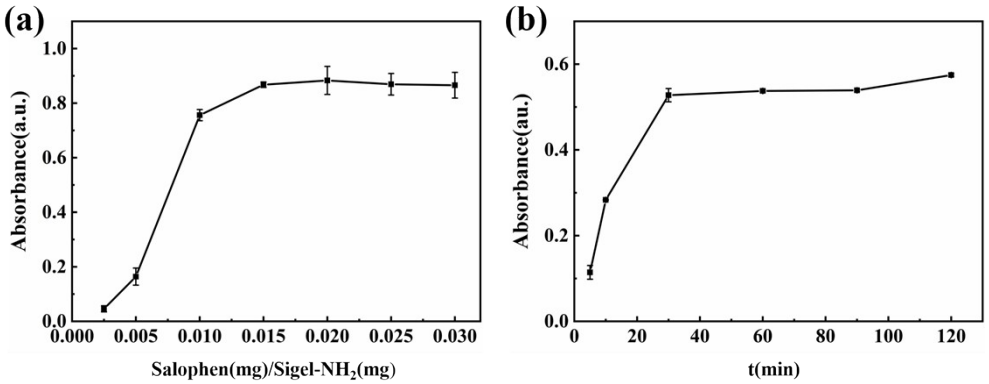


Fig. S5† Effect of Salophen and Sigel-NH_2 (a) mass ratio and (b) reaction time on the absorbance spectra.

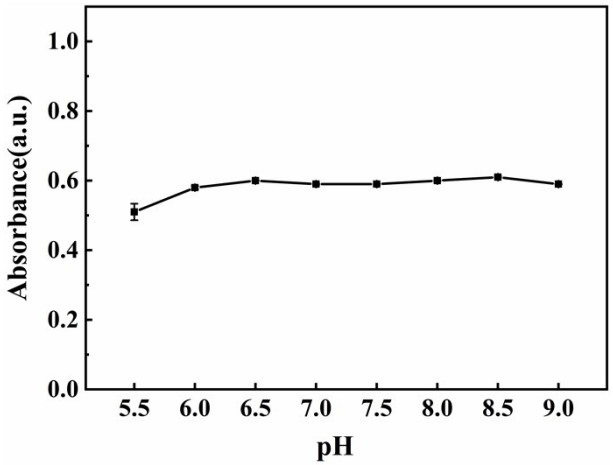


Fig. S6† Effect of pH on the combination reaction of Eu^{3+} with Sigel-NH_2-Salophen particles.

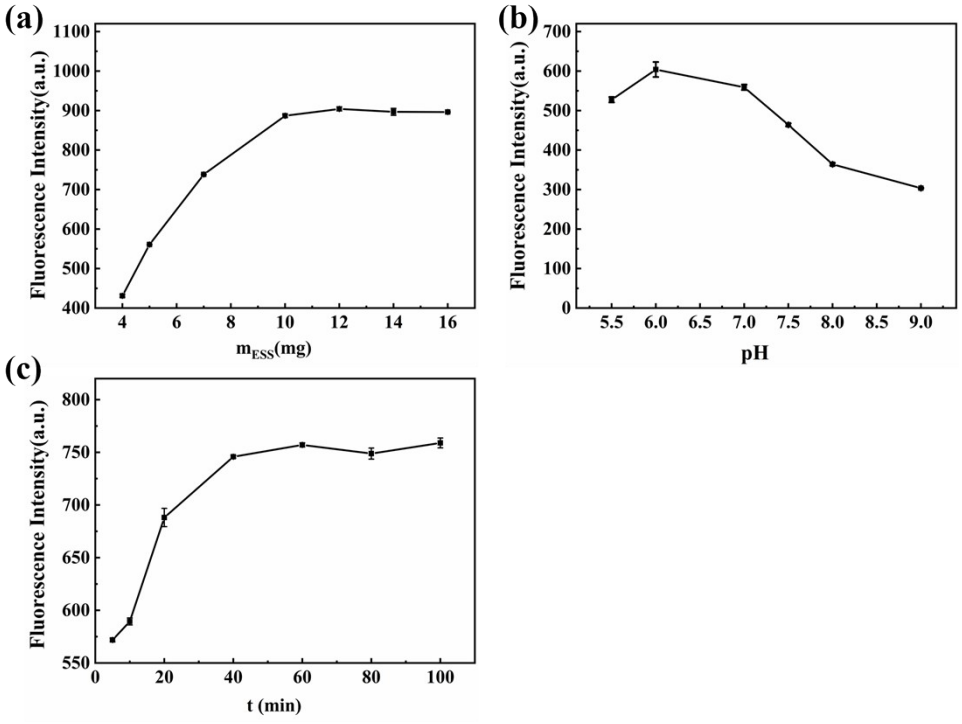


Fig. S7† Effect of (a) the mass of ESS particles, (b) pH, (c) reaction time on the combination reaction of MP

with ESS particles.

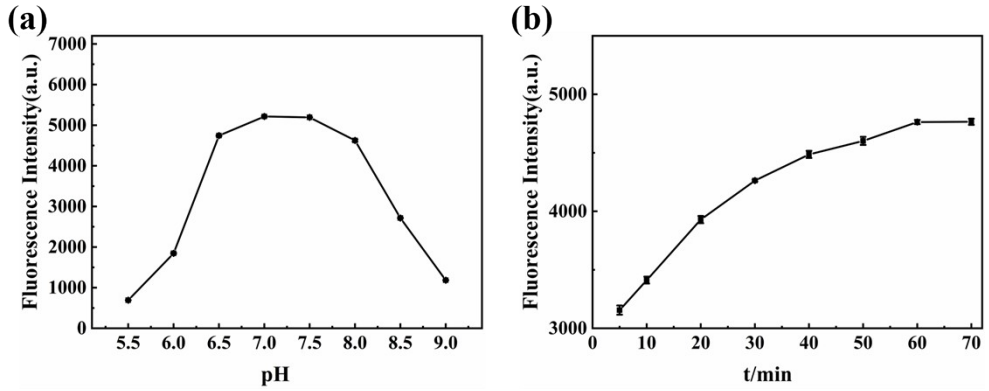


Fig. S8† Effect of (a) the pH, (b) reaction time on the combination reaction of N-5-AF with ESS-MP particles.

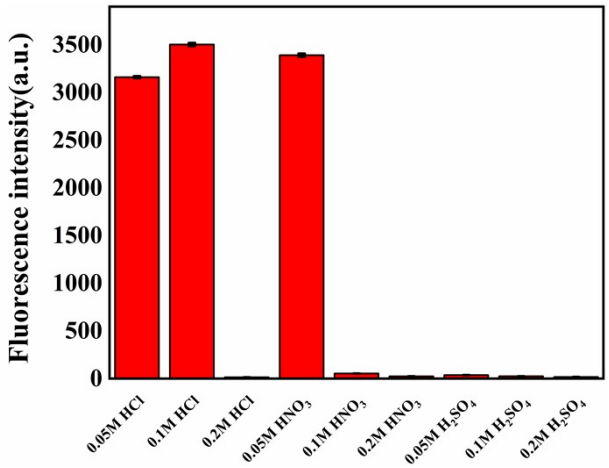


Fig. S9† Effect of eluents on the elute N-5-AF-MP from particles.

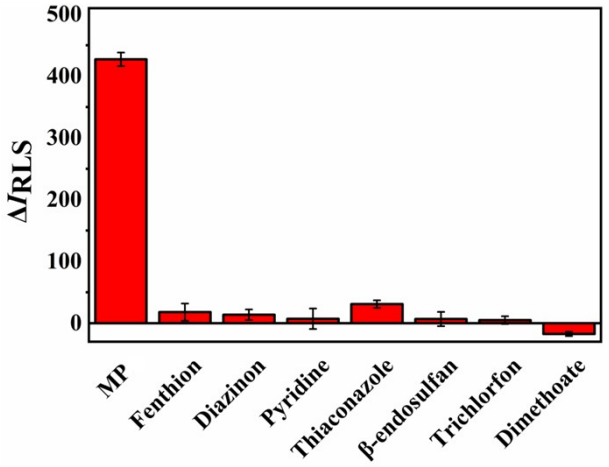


Fig. S10† The change of RLS intensity of I-N-Sal interacting with different pesticides. (Experimental

conditions: [MP] = 0.3 μM; [Fenthion, Diazinon, Pyridine, Thiaconazole, β-endosulfan] = 3 μM; [Trichlorfon, Dimethoate] = 6 μM)

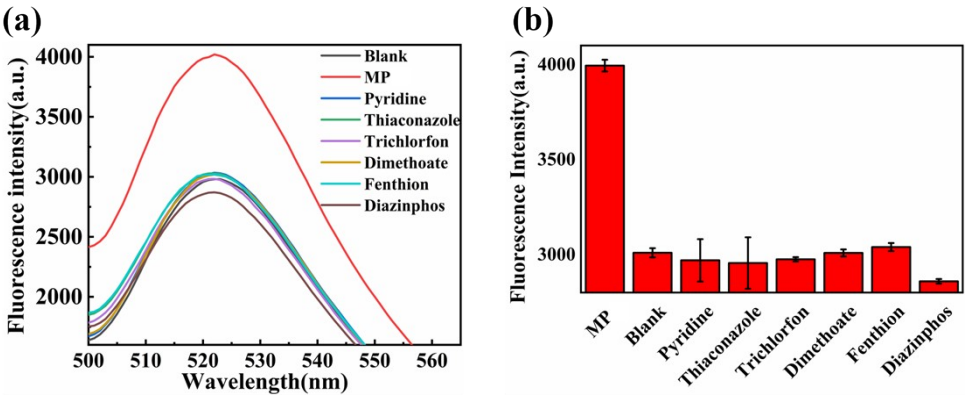
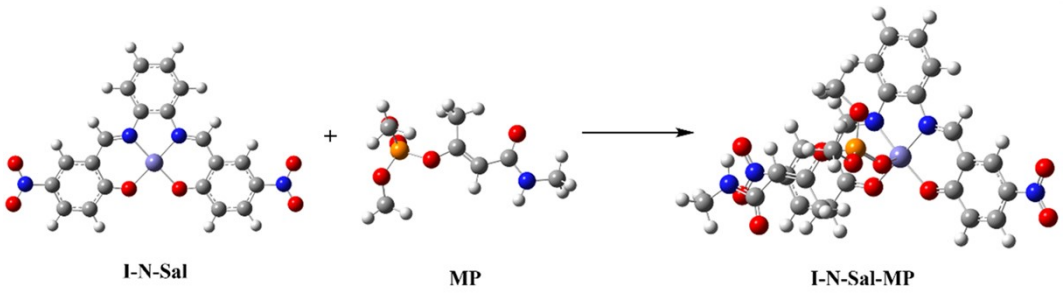


Fig. S11† (a)The fluorescent spectra of ESS/N-5-AFwith different pesticides. (b) A competitive binding assay with ESS/N-5-AFwith different pesticides. (Experimental conditions: [MP] = 3 μM; [Fenthion, Diazinon, Pyridine, Thiaconazole] = 30 μM; [Trichlorfon, Dimethoate] = 60 μM)



I-N-Sal	MP	I-N-Sal-MP	ΔE (Kcal/mol)
-2702.26	-1046.91	-3749.24	-43.93

Fig. S12† The possible coordination patterns between the sensor I-N-Sal and MP at the B3LYP/6–31G(d) level

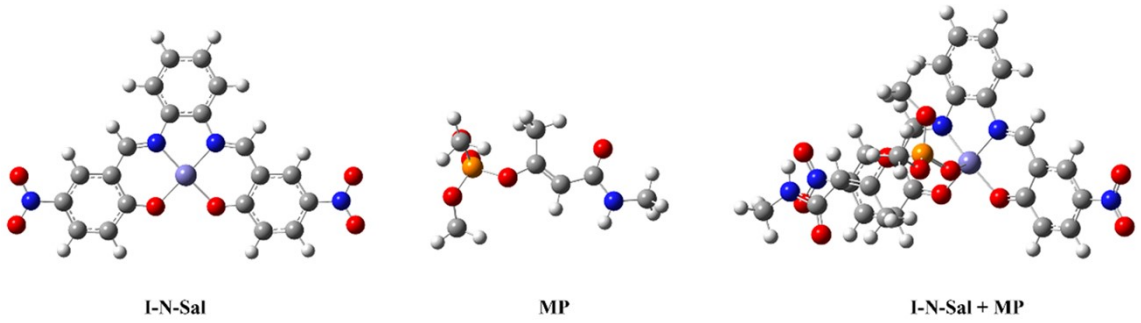


Fig. S13† The optimized molecular structure of I-N-Sal, MP and I-N-Sal + MP

Table S1† Comparison of the proposed I-N-Sal and ESS/N-5-AFsensors with the previously reported sensors.

Functional monomer	Methods	Analytes	Linear range	LOD	Ref.
Burkholderia cepacia lipase@MOF	Electrochemistry	Methyl parathion	0.1 – 38 μM	0.067 μM	38
AuNPs/PANI	Electrochemistry	Profenofos	0.10 μM – 10 μM	0.27 μM	39
HP probe modified	Electrochemistry	Aldicarb	–	10 μM	40
h-CNT-lPs/Nafion	Electrochemistry	Methyl parathion	0.3–20.0 μM 20.0 – 150.0 μM	0.092 μM	17
CS-cMWCNT-HA	Electrochemistry	Paraoxon	5.0 – 80.0 μM	0.1 μM	41
ERGO-CS/Hb	Electrochemistry	Methy	0.076 – 0.988 μM	79.77 nM	42
Ag nano-enzyme	Colorimetry	Omethoate	0.1 –10 μmol L^{-1}	0.1 μmol L^{-1}	43
FeOTiO/rGO	Colorimetry	Atrazine	2 – 20 μg L^{-1}	2.98 μg L^{-1}	44
TPE-1	Fluorescence	OPPs	0.009 – 22.5 mg/L	0.008 mg/L	45
PFS	Fluorescence	diazinon	0 – 12.5 ng mL^{-1}	0.5 ng mL^{-1}	46
TPE-Peptide	Fluorescence	Methyl parathion	1 – 100 μM	–	47
Eu (lll)-bis (Coumarin-3 carboxylic acid)	Fluorescence	Phosdrin	1.0-8 μM	6.28 μM	48
Tb (III)-bis (Coumarin-3- carboxylic acid)	Fluorescence	Phosdrin	6.28-100 μM	1.07 μM	48
I-N-Sal	RLS	monocrotophos	0.1 – 1.1 μM	30 nM	This work
ESS/N-5-AF	Fluorescence	monocrotophos	1.3 – 7.0 μM	0.4 μM	This work

Table S2† The RLS analytical results of real samples in different tap water and camellia oil (n = 6).

Sample	RLS found （μM）	Spike (μM)	Total found （μM）	RSD (%)	Recovery (%)
Tap water 1	–	0.300	0.290	3.4	98.0
Tap water 2	–	0.300	0.310	2.4	102.7
camellia oil 1	–	0.300	0.297	2.2	99.1
camellia oil 2	–	0.300	0.307	2.9	102.3
camellia oil 3	–	0.300	0.309	1.5	103.0
camellia oil 4	–	0.300	0.292	3.8	97.4
camellia oil 5	–	0.300	0.291	3.1	97.0

–Not detected

Table S3† The fluorescent analytical results of real samples in different tap water and camellia oil (n = 6).

Sample	FL found （μM）	Spike (μM)	Total found （μM）	RSD (%)	Recovery (%)
Tap water 1	–	3.00	3.03	4.5	101.1
Tap water 2	–	3.00	2.90	3.8	96.6
camellia oil 1	–	3.00	2.98	2.0	99.3
camellia oil 2	–	3.00	2.93	3.8	97.8

–Not detected