

Visual Detection of H₂O₂ and Melamine based on PW₁₁MO₃₉ⁿ⁻ (M = Cu²⁺, Co²⁺, Mn²⁺, Fe³⁺) and PW₉M₃O₃₄ⁿ⁻ (M = Cu²⁺, Co²⁺, Mn²⁺, Fe³⁺)

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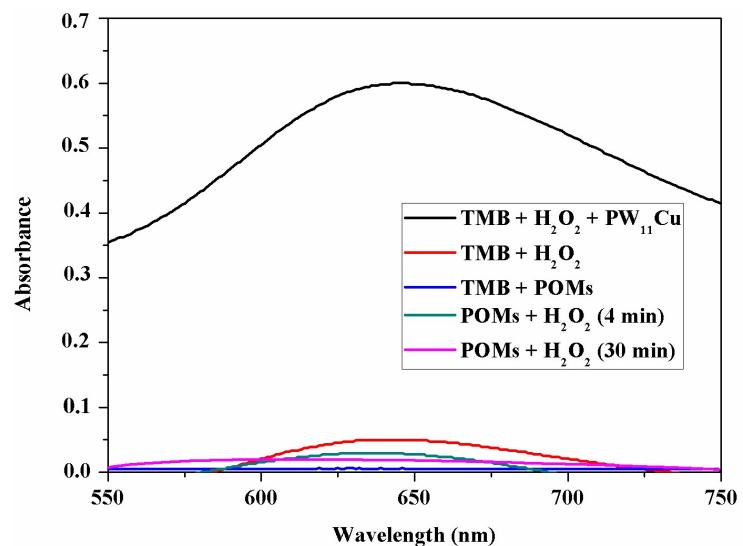


Fig. S1 The UV-Vis spectra of TMB+H₂O₂, TMB+POMs, POMs+H₂O₂ and TMB+H₂O₂+PW₁₁Cu

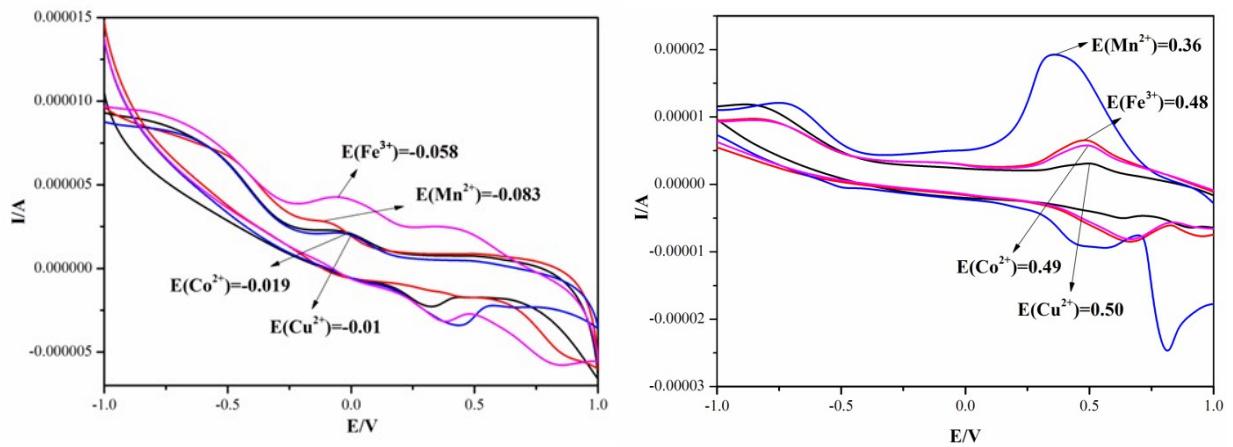


Fig. S2 The cyclic voltammogram of POMs

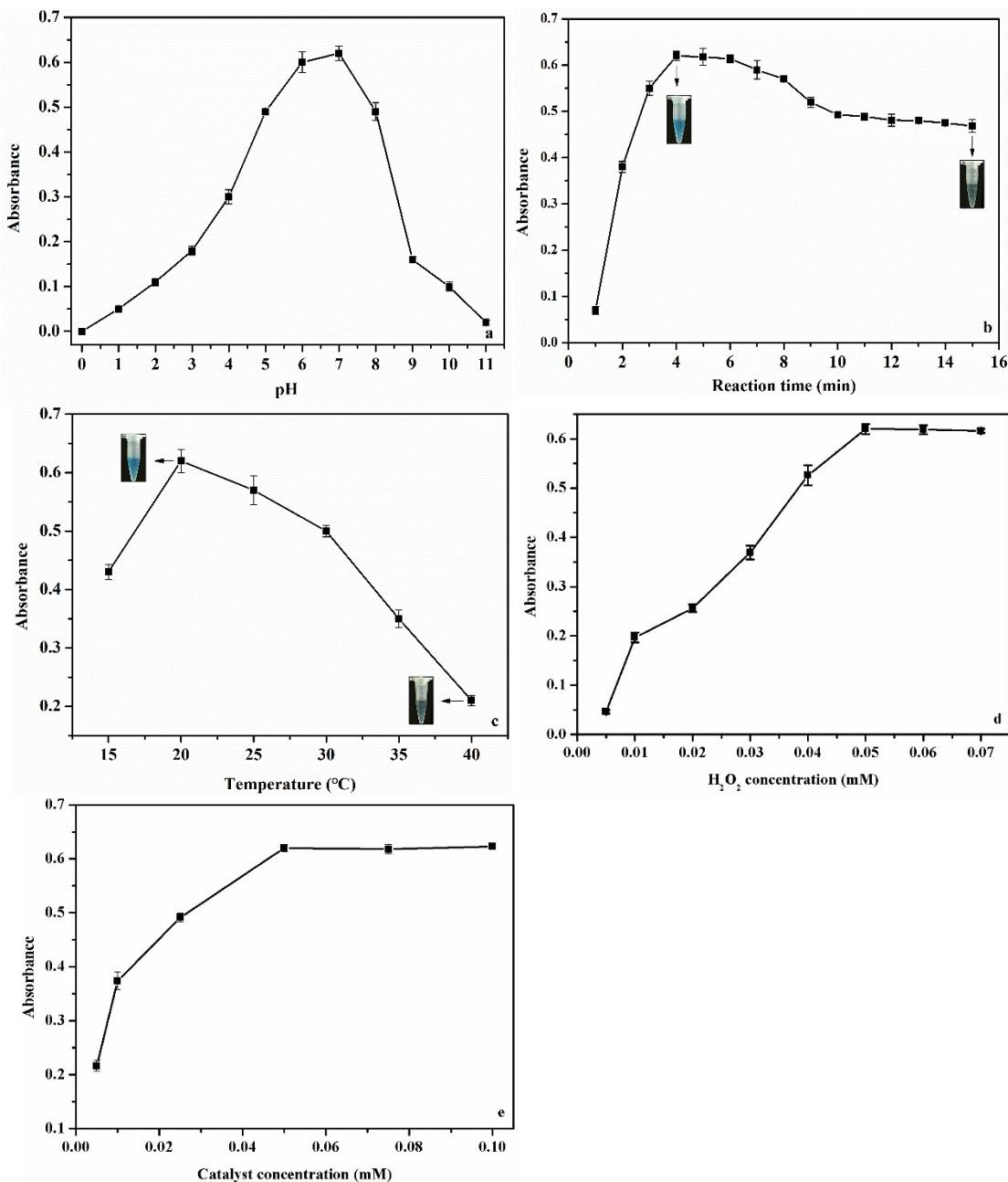


Fig. S3 Main parameters for PW₁₁Cu on detection of H₂O₂. pH (a), time (b), temperature (c), H₂O₂ concentration (d) and catalyst concentration (e). The error bars represent the standard deviation of three measurements.

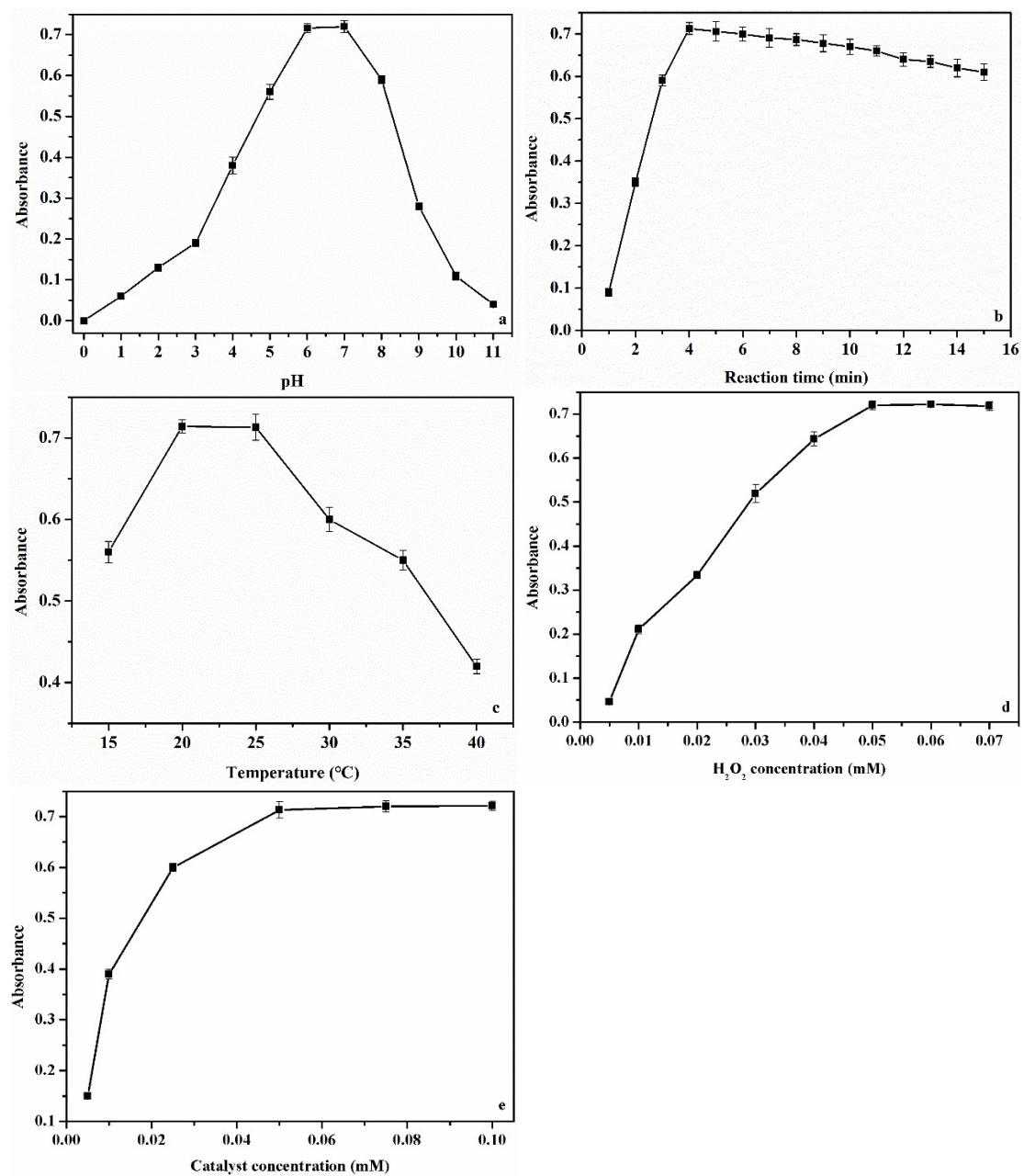


Fig. S4 Main parameters for PW₉Cu₃ on detection of H₂O₂. pH (a), time (b), temperature (c), H₂O₂ concentration (d) and catalyst concentration (e). The error bars represent the standard deviation of three measurements.

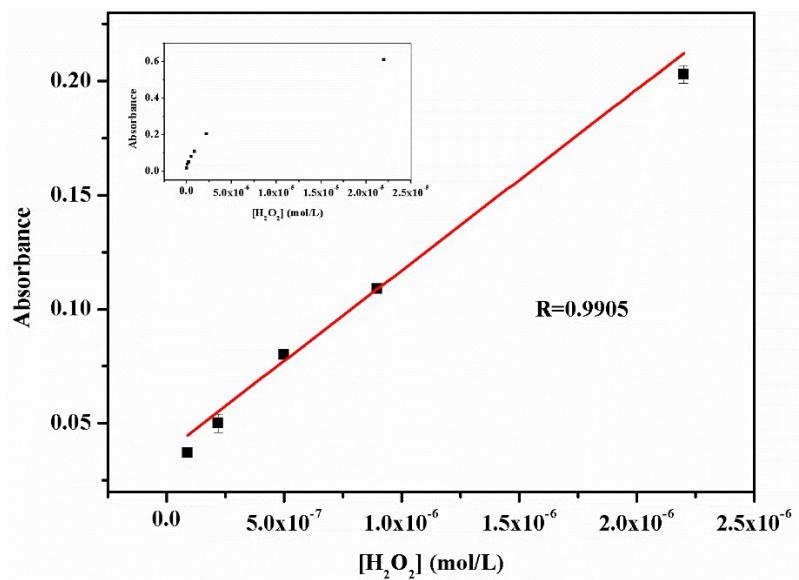


Fig. S5 The linear calibration plot for H₂O₂ detection based on PW₁₁Cu. The error bars represent the standard deviation of three measurements. The error bars represent the standard deviation of three measurements.

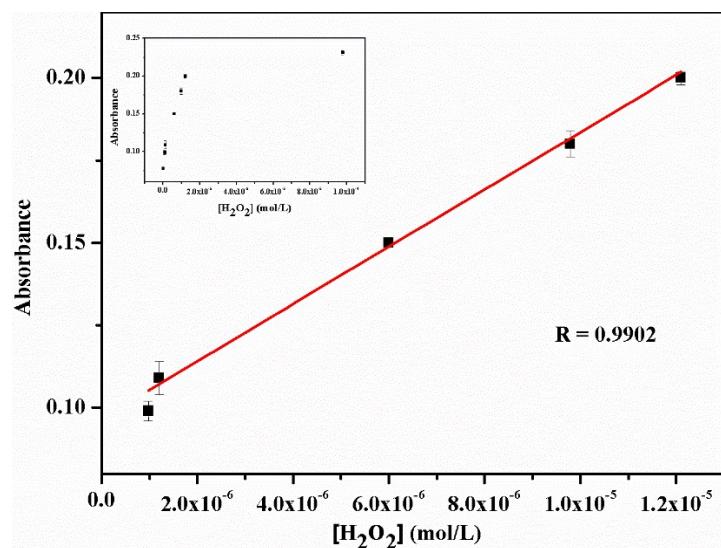


Fig. S6 The linear calibration plot for H_2O_2 detection based on PW_9Cu_3 . The error bars represent the standard deviation of three measurements. The error bars represent the standard deviation of three measurements.

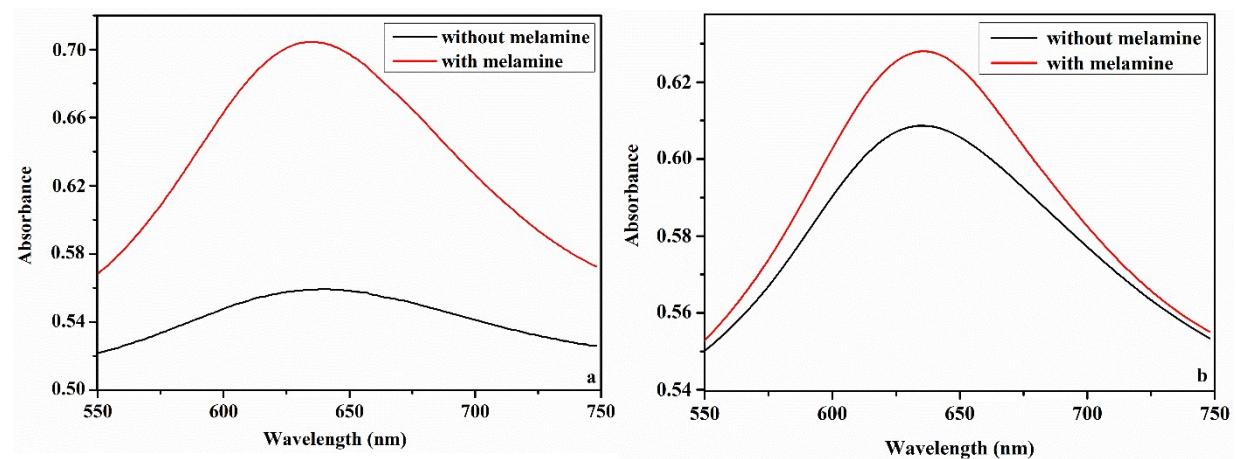


Fig. S7 The UV-Vis spectra of PW₁₁Co (a) and PW₁₁Cu (b) in TMB/H₂O₂ in presence or absence of melamine.

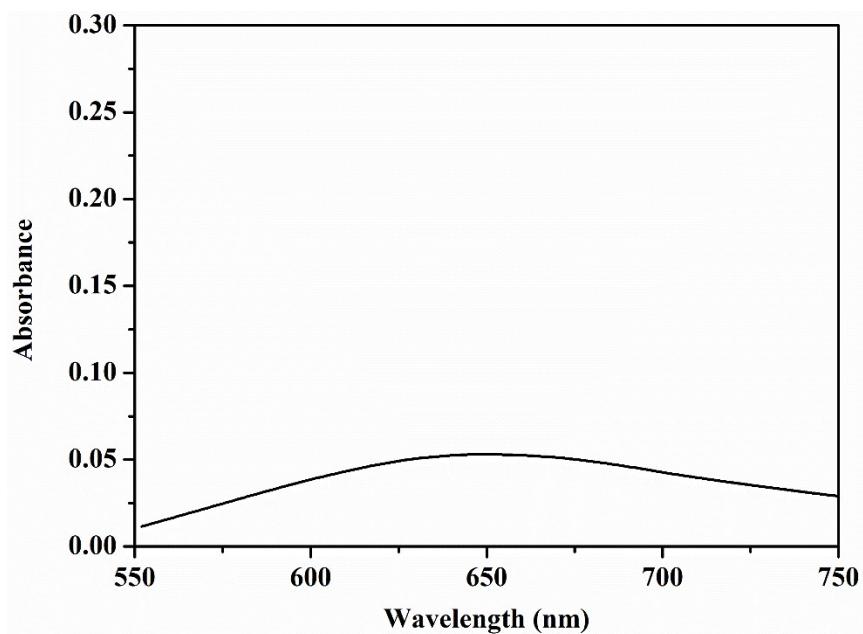


Fig. S8 The UV-Vis spectrum of TMB/H₂O₂/melamine.

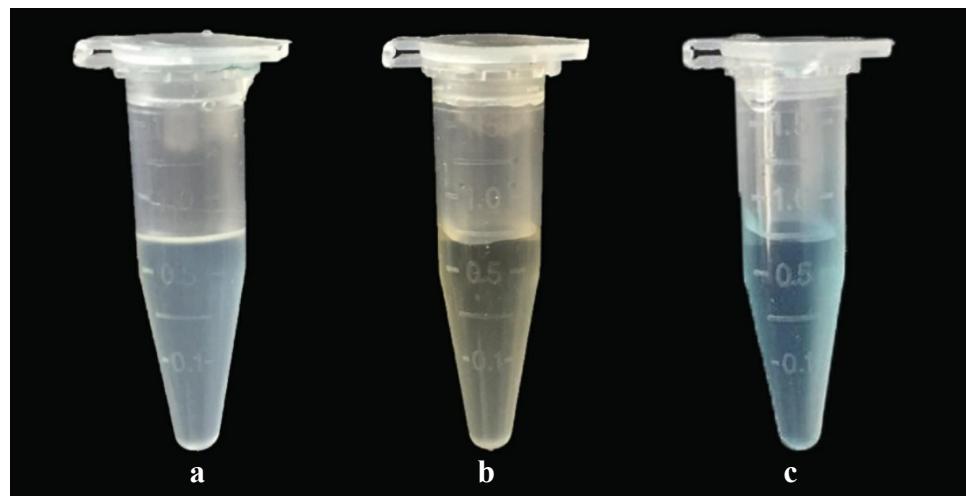


Fig. S9 The photographs of TMB/H₂O₂/melamine (a), H₂O₂/melamine (b) and TMB/H₂O₂/PW₁₁Co/melamine (c).

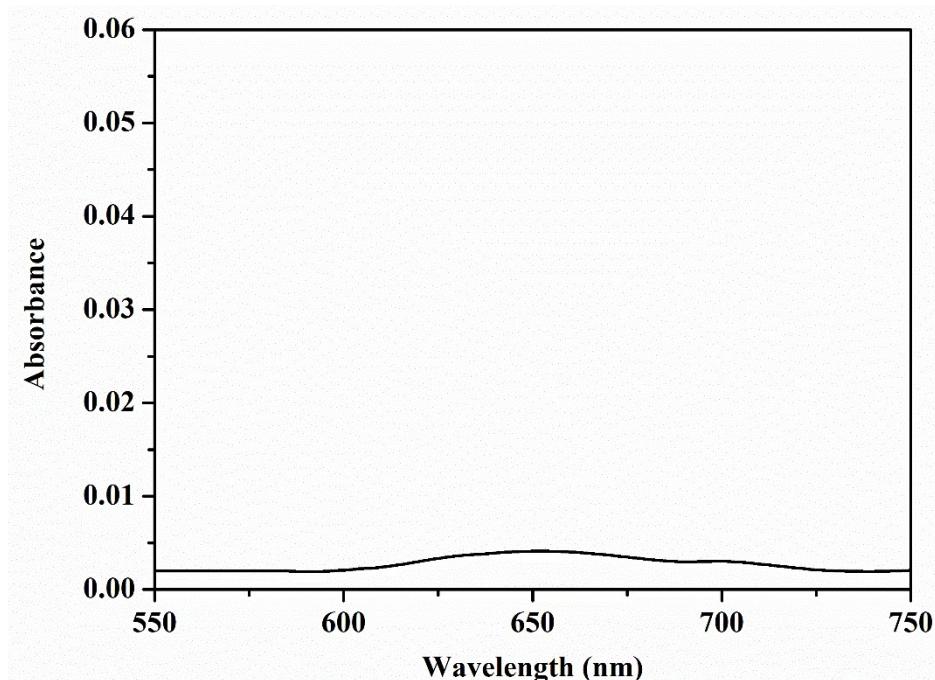


Fig. S10 The UV-Vis spectrum of H₂O₂/melamine.

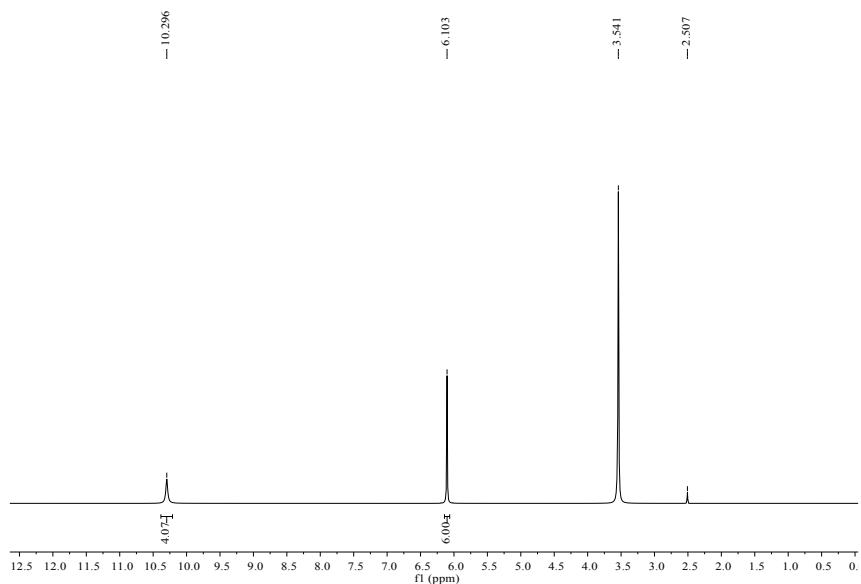
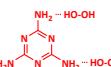


Fig. S11 The ¹H NMR of  (¹H NMR (500 MHz, DMSO-d₆) δ 10.30 (br s, 4H), 6.10 (br s, 6H))

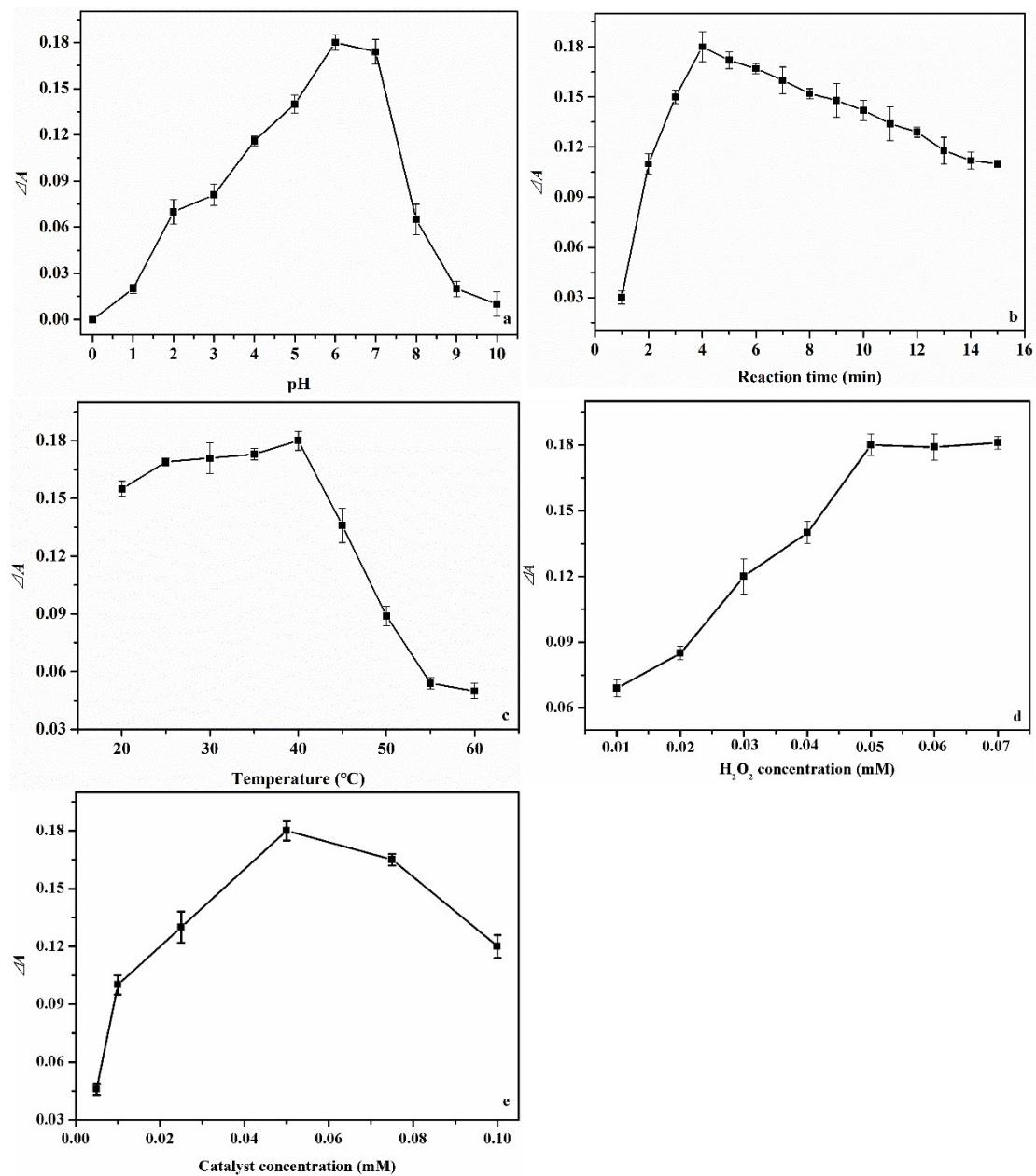


Fig. S12 Main parameters for PW₁₁Co on detection of melamine. pH (a), time (b), temperature (c), H₂O₂ concentration (d) and catalyst concentration (e). The error bars represent the standard deviation of three measurements.

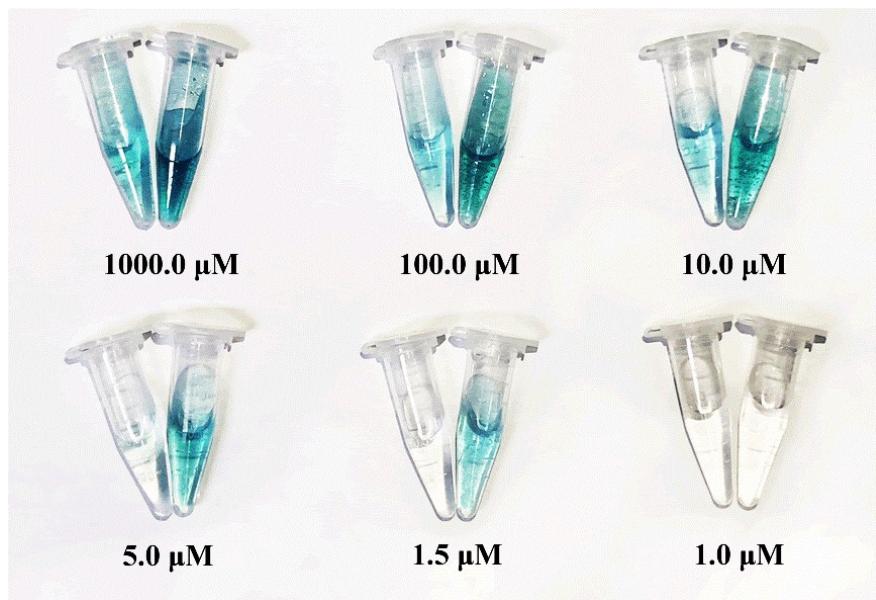


Fig. S13 The color change in TMB/H₂O₂/PW₁₁Co with different concentrations of melamine (TMB/H₂O₂/PW₁₁Co on the left, TMB/H₂O₂/PW₁₁Co/melamine on the right).

Table S1 Comparison of different catalysts for the detection of melamine in colorimetric method.

Catalysts	Linear range (μM)	Detection limit (μM)	pH	References
Ag NPs	0.1-1.2	0.01	7.5-9.5	1
Au NPs	0-1	0.0245	6.0-8.0	2
Au NPs	0.75-1.75	0.005	5.8-7.4	3
Ag NPs	0.05-1.4	0.01	8.0	4
Ag NPs C-dots	2-20	0.03	10.5	5
Ag NPs	1.5-12.6	0.317	8.0	6
$\text{Cu}_{2-x}\text{Se}@\text{PSS}$ NPs	0.0047-29.7	0.0012	4.6	7
NT-Au NPs	0.75-5	0.0035	7.0	8
Au NPs	0.39-3.97	0.238	5.2	9
Fe_3O_4 MNPs	0.2-200	0.11	3.5	10
Au NCs	0.5-10.0	0.15	6.0	11
Ag NPs	0.05-1	0.00498	8.0	12
Au NPs-TMB- H_2O_2	0.001-0.8	0.0002	4.5	13
cysteamine-modified Au NPs	0.08-1.6	0.008	4.0	14
label free Ag NPs	4.0-170	2.32	7.0-9.0	15
Au NPs	0.0048-1.6	0.0064	7.0	16
Fe_3O_4 nanoparticles- H_2O_2^- ABTS	2.0-40.0	2	4.0	17
Ag NPs	-	0.8	-	18
PW_{11}Co	0.5-10	0.1	2.0-9.0	This work
$\text{PW}_{11}\text{Co}/\text{graphene}$	0.2-8	0.02	2.0-9.0	This work

Table S2 The ΔA between TMB/H₂O₂/PW₁₁M(PW₉M₃) and TMB/H₂O₂/PW₁₁M(PW₉M₃)-melamine. Reaction conditions as: 0.05 mM POMs, 0.08 mM TMB, 0.05 mM H₂O₂, 0.05 mM melamine, pH = 7.0, 4 min and 20 °C.

catalyst	H ₂ O ₂ /TMB	H ₂ O ₂ /TMB/ melamine	ΔA
PW ₉ Cu ₃	0.720	0.721	0.001
PW ₉ Co ₃	0.341	0.343	0.002
PW ₉ Fe ₃	0.248	0.258	0.010
PW ₉ Mn ₃	0.068	0.081	0.013
PW ₁₁ Cu	0.609	0.629	0.020
PW ₁₁ Co	0.556	0.706	0.149
PW ₁₁ Fe	0.236	0.251	0.015
PW ₁₁ Mn	0.051	0.057	0.006

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