

Electronic Supplementary Information (ESI) for

**Facile colorimetric detection of alkaline phosphatase activity
based on target-induced valence state regulation of oxidase-
mimicking Ce-based nanorods**

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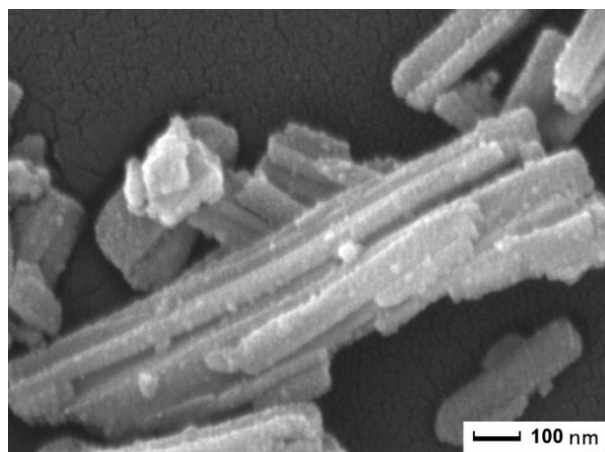


Figure S1. SEM image of original Ce-MOF.

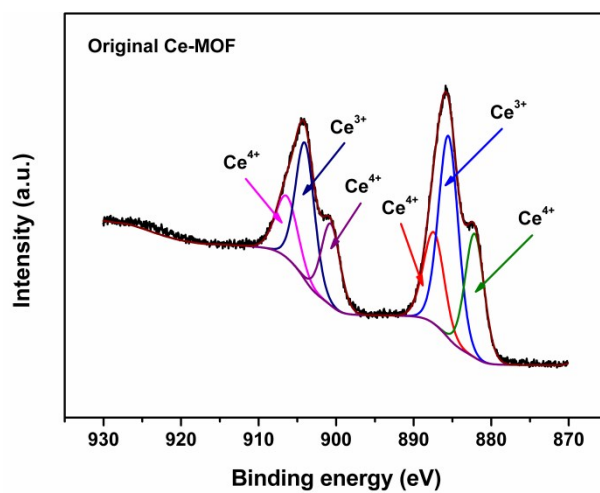


Figure S2. Ce 3d XPS of original Ce-MOF.

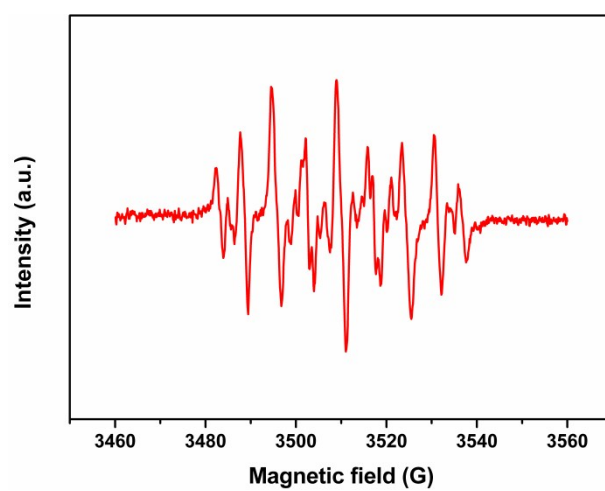


Figure S3. EPR pattern of MVCM.

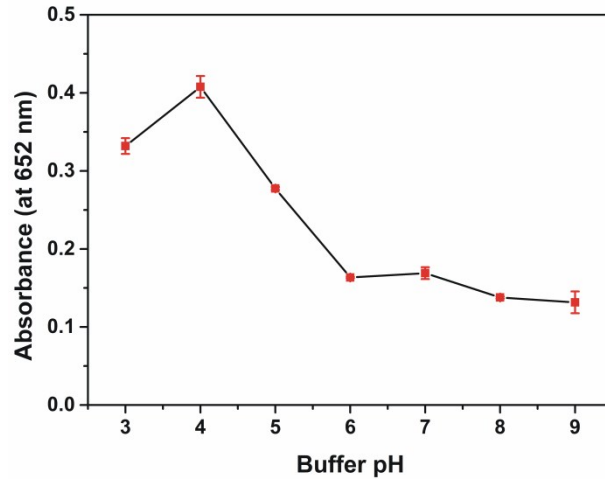


Figure S4. Effect of buffer pH on the MVCM+TMB reaction. Buffer: 0.2 M NaAc-HAc with different pH (adjusted by NaOH); TMB concentration: 0.17 mM; MVCM concentration: 0.05 mg mL⁻¹; reaction time: 10 min.

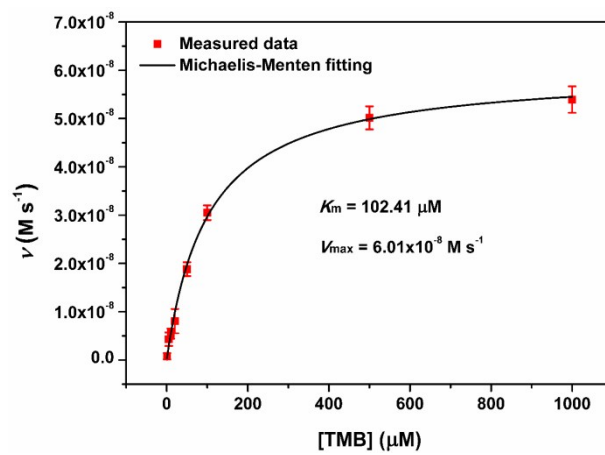


Figure S5. Steady-state kinetics measurement of MVCM as an oxidase mimic toward the TMB substrate.

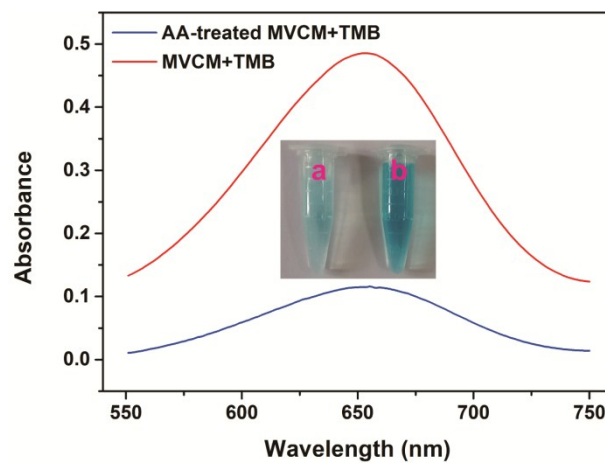


Figure S6. UV-Vis spectra of the TMB chromogenic reaction catalyzed by MVCM or AA-treated MVCM (the inset shows the corresponding photograph, a—AA-treated MVCM+TMB, b—MVCM+TMB). TMB concentration: 0.17 mM; MVCM or AA-treated MVCM concentration: 0.05 mg mL⁻¹; reaction time: 10 min.

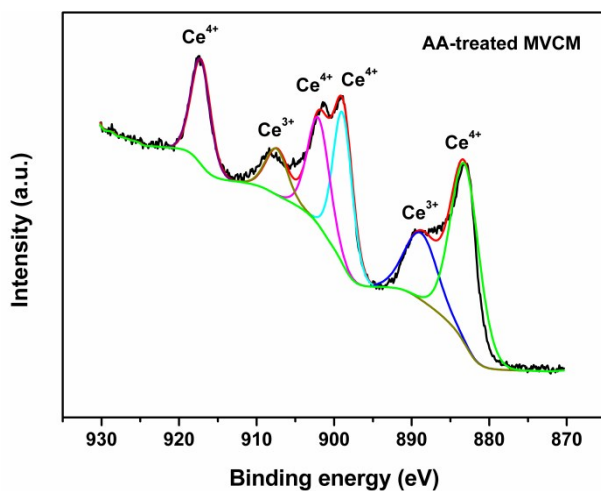


Figure S7. Ce 3d XPS of AA-treated MVCM.

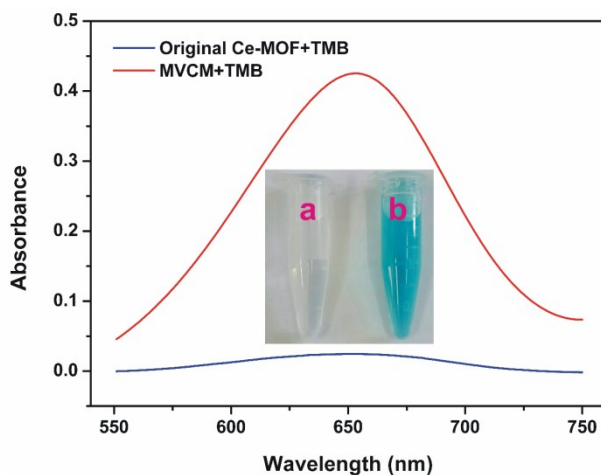


Figure S8. UV-Vis spectra of the TMB chromogenic reaction catalyzed by MVCM or original Ce-MOF (the inset shows the corresponding photograph, a—original Ce-MOF+TMB, b—MVCM+TMB). TMB concentration: 0.17 mM; MVCM or original Ce-MOF concentration: 0.05 mg mL⁻¹; reaction time: 10 min.

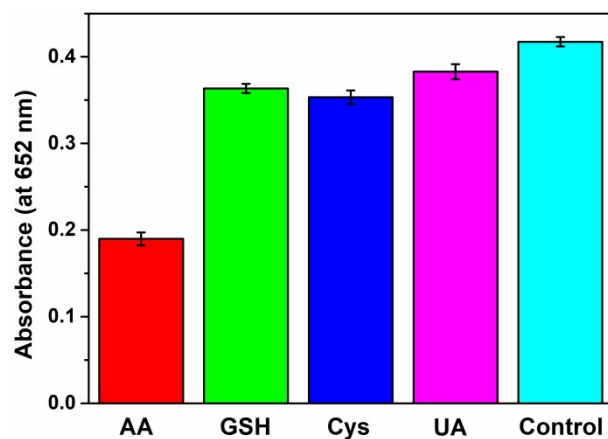


Figure S9. Effects of other reducing species (GSH, Cys, and UA) on the AA-suppressed MVCM+TMB reaction. AA, GSH, Cys, or UA concentration: 100 μM ; TMB concentration: 0.17 mM; MVCM concentration: 0.05 mg mL⁻¹.

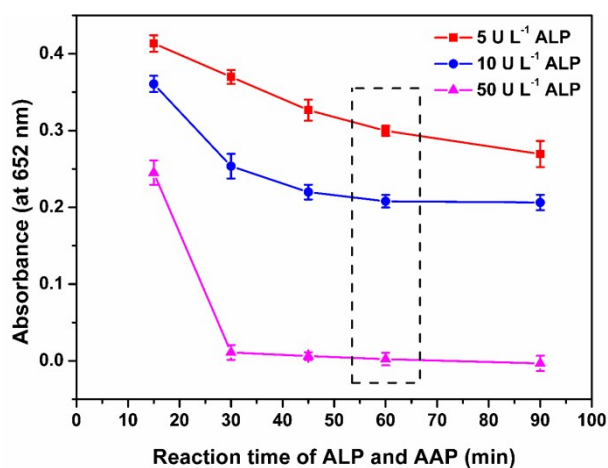


Figure S10. Effect of the reaction time of ALP and AAP on ALP activity detection.

Table S1. Performance comparison of our strategy with previous approaches for ALP activity sensing.

Principle	Method	Linear range (U L ⁻¹)	LOD (U L ⁻¹)	Ref.
PPi-triggered competitive displacement of fluorescein-labeled DNA on MVCM	Fluorescent	2~100	0.18	[1]
Copper-mediated DNA-scaffolded silver nanocluster switching	Fluorescent	30~240	5	[2]
Inhibition of DNA-templated copper nanoparticles by PPi	Fluorescent	0.3~7.5	0.3	[3]
Quenching and restoration of the fluorescence of CDs	Fluorescent	2.5~40	1	[4]
PPi-mediated regulation of the fluorescence of CQDs	Fluorescent	16.7~782.6	1.1	[5]
Eu ³⁺ -mediated on-off-on phosphorescence of Mn-doped ZnSQDs	Phosphorescent	0.15~18	0.065	[6]
Fluorogenic reaction of <i>o</i> -phenylenediamine and AA	Fluorescent	0.1~30	0.06	[7]
Target-triggered competitive redox reaction of g-C ₃ N ₄ /CoOOH	Fluorescent	1~30	0.92	[8]
Phosphate-quenched oxidase-like activity of Ce ⁴⁺ ions	Colorimetric	0~50, 50~250	2.3	[9]
Target-induced valence state regulation of oxidase-mimicking MVCM	Colorimetric	0.5~25	0.1	This work

Table S2. Recovery results of ALP spiked in serum.

Sample	Added (U L⁻¹)	Measured (U L⁻¹)^a	Recovery (%)	RSD (n = 3, %)
1#	5	4.47	89.4	6.4
2#	10	10.39	103.9	5.1
3#	15	14.76	98.4	5.9
4#	20	21.10	105.5	4.4
5#	25	26.37	105.5	5.3

^a The data were obtained after subtracting the original levels of ALP in human serum.

References

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