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Supporting Information

In-situ growth of CeO_2 onto g-C_3N_4 nanosheets toward spherical g-C_3N_4/CeO_2 nanozyme with enhanced peroxidase-like catalysis: A selective colorimetric analysis strategy for mercury (II)

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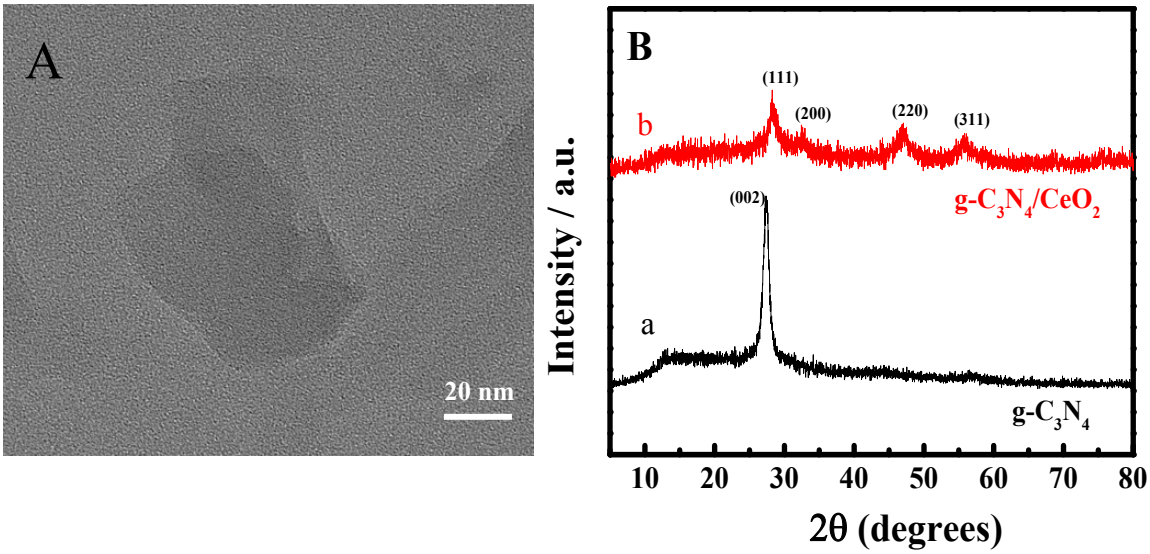

Fig. S1 (A) TEM image of g-C_3N_4 nanosheets, (B) XRD patterns of (a) g-C_3N_4 and (b) g-C_3N_4/CeO_2.

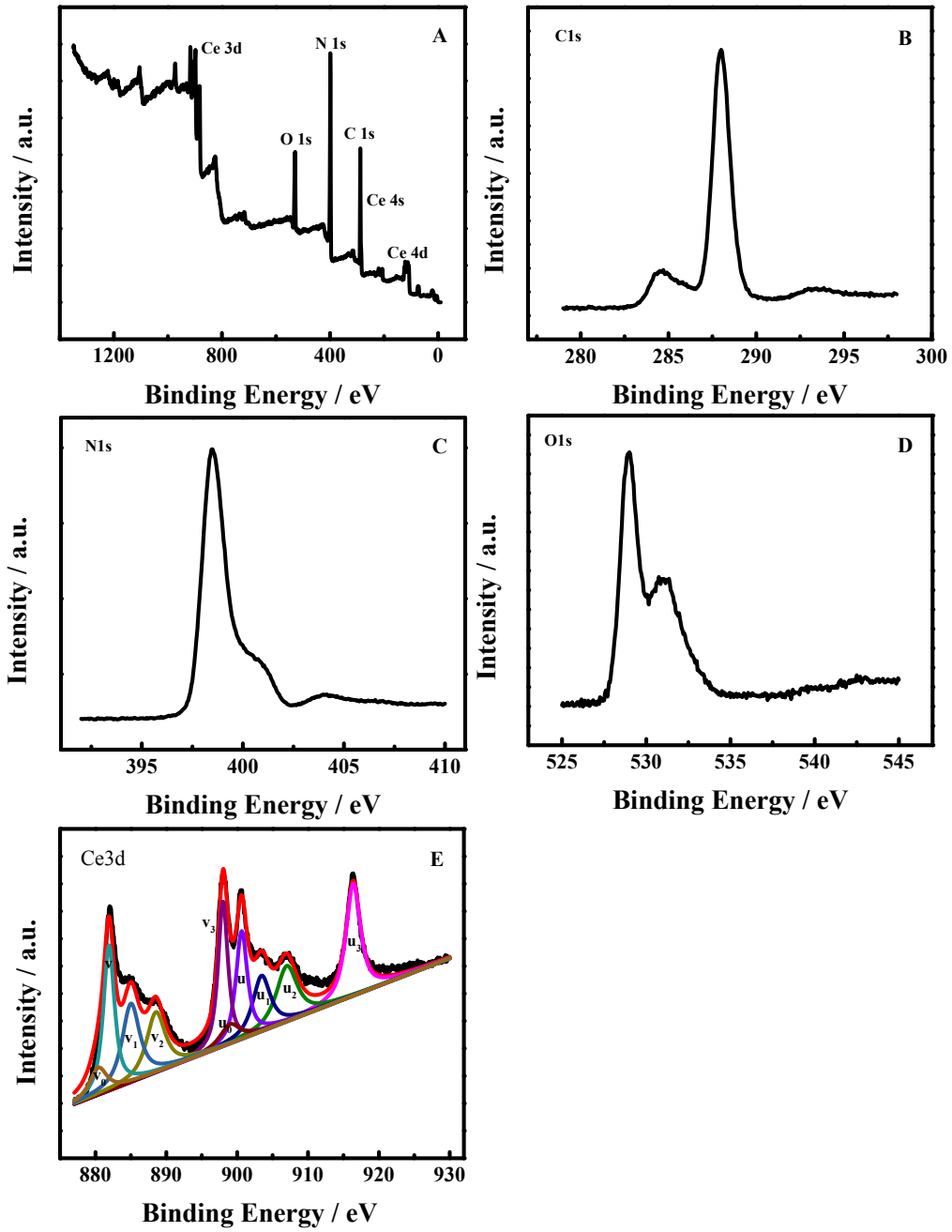

Fig. S2 (A) XPS survey spectra of g-C_3N_4/CeO_2, core level XPS spectra of (B) C 1s, (C) N 1s, (D) O 1s, (E) Ce 3d.

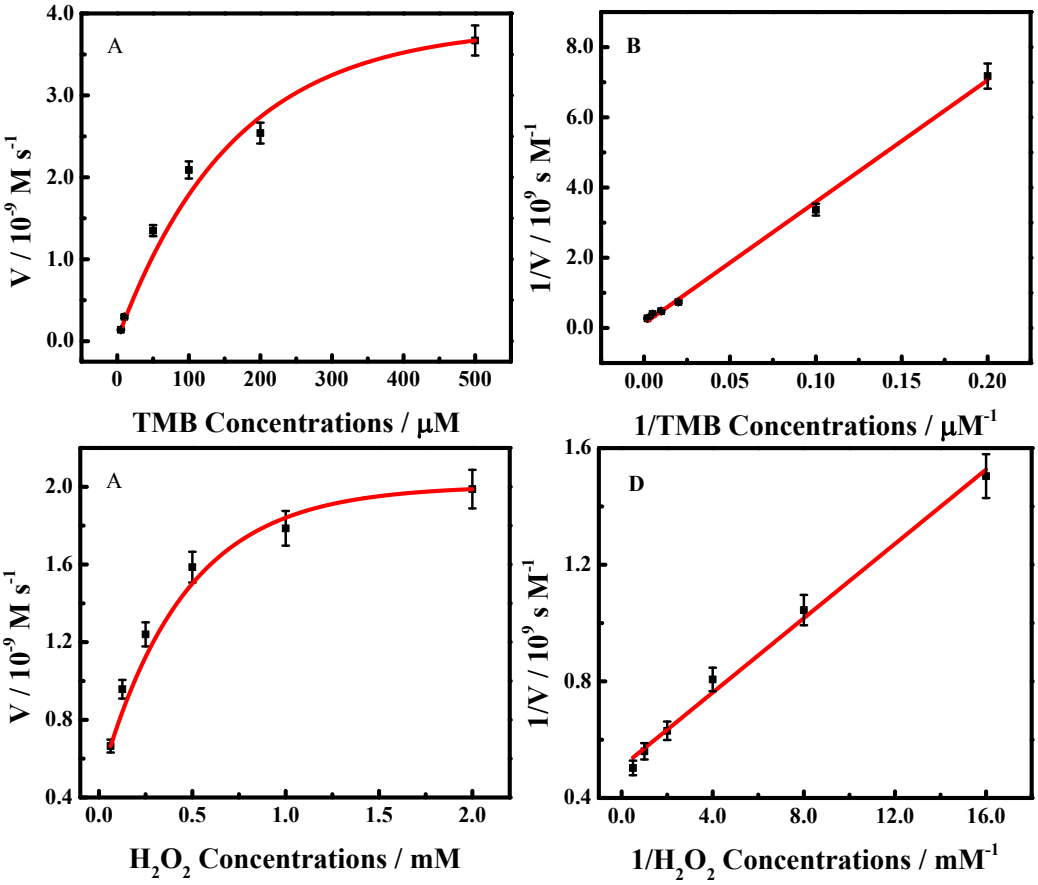

Fig. S3 Steady-state kinetic assays and corresponding double reciprocal (Lineweaver-Burk) plots of CeO_2 for (A, B) TMB and (C, D) H_2O_2.

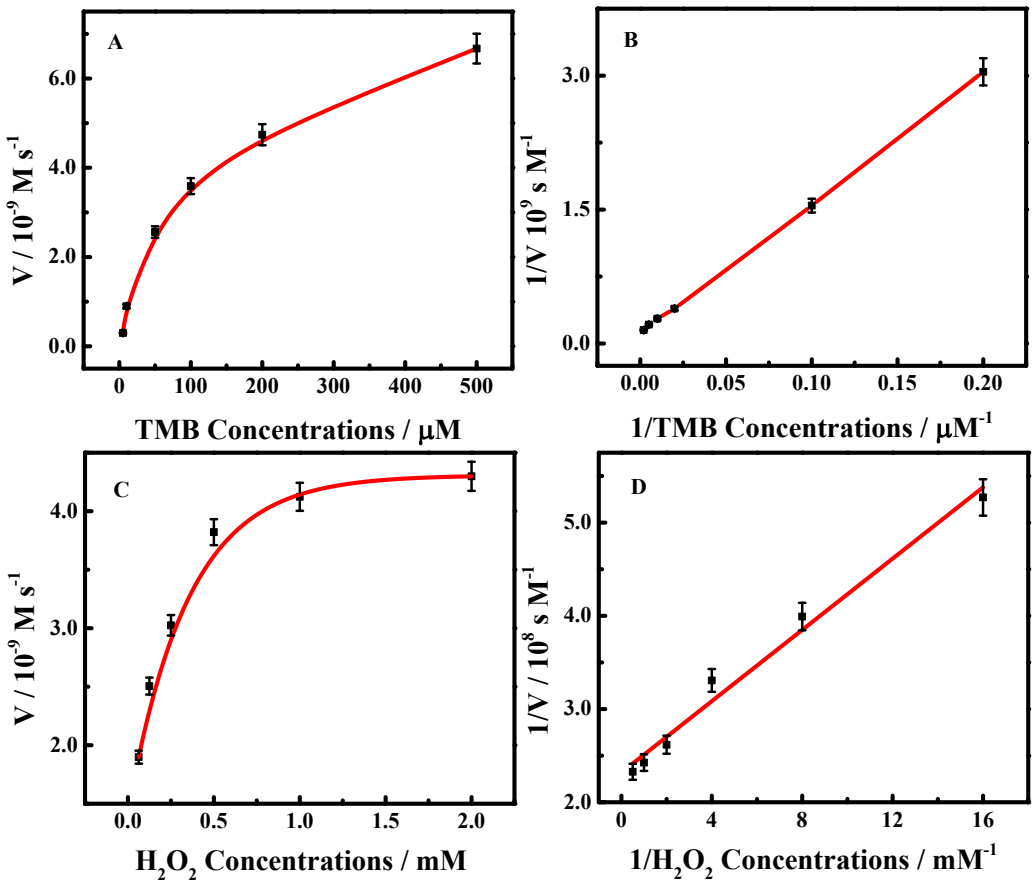

Fig. S4 Steady-state kinetic assays and corresponding double reciprocal (Lineweaver-Burk) plots of g-C_3N_4/CeO_2 for (A, B) TMB and (C, D) H_2O_2.

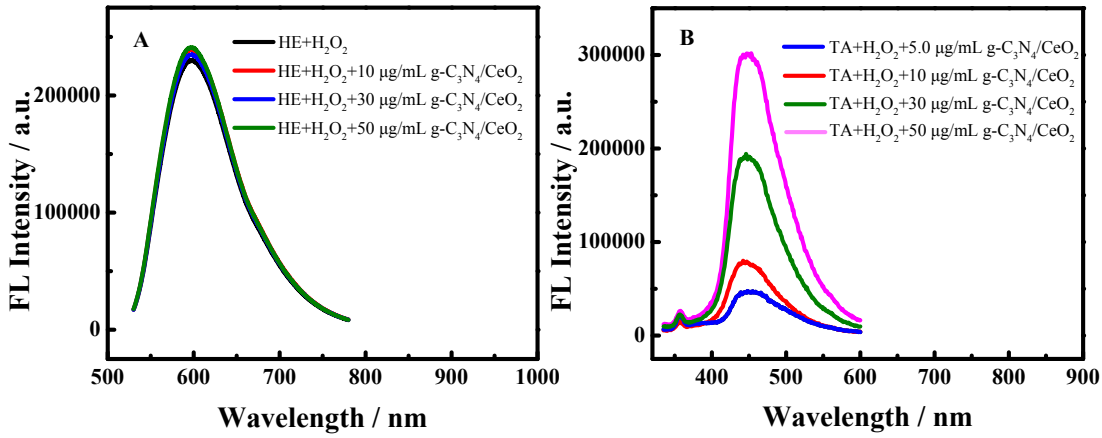

Fig. S5 Fluorescent spectra of (A) 0.30 mM hydroethidine (HE) and (B) 400 μM *p*-phthalic acid (TA) in the absence and presence of 40 mM H_2O_2 or 40 mM H_2O_2 in 0.10 mM NaOAc-HOAc buffer (pH 4.0) using g-C_3N_4/CeO_2 of different concentrations.

Table S1 Comparison of the kinetic parameters of g-C_3N_4/CeO_2, CeO_2 and HRP.

	Substrate	K_m (mM)	$V_m \times 10^{-8}$ ($M \cdot s^{-1}$)
CeO_2	TMB	0.212	0.572
	H_2O_2	0.145	0.281
g-C_3N_4/CeO_2	TMB	0.112	0.985
	H_2O_2	0.082	0.437
HRP	TMB	0.434	10.0
	H_2O_2	3.70	8.71

Accordingly, comparable investigations indicate that g-C_3N_4/CeO_2 could possess even higher substrate affinity than HRP. Moreover, the advantages of the developed g-C_3N_4/CeO_2 nanozyme over the common natural enzymes may be summarized as the following aspects. Firstly, g-C_3N_4/CeO_2 can possess better stability in a wider temperature and pH range. Secondly, as compared with the common natural enzymes, the developed nanozyme can have a lower Michaelis-Menten constant to the substrates, showing a higher affinity to the substrates. Finally,

g-C_3N_4/CeO_2 can recognize Hg^{2+} ions with high specificity resulting in the rationally enhanced catalytic activity for the Hg^{2+} analysis. Besides, g-C_3N_4/CeO_2 nanozyme containing abundant amino functionalities may be readily applied for the modification of probes or bioreceptors like antibody molecules for wide bioanalytical applications.

Table S2 Practical applications for the analysis of Hg^{2+} in wastewater samples.

Samples	**1**	**2**	**3**	**4**
Added (nM)	5.0	10.00	20.00	40.00
Detected (nM)	4.73±0.84	9.62±1.87	18.98±1.34	38.72±2.61
Recovery (%)	94.6	96.2	94.9	96.8

Table S3 Practical applications for the analysis of Hg^{2+} in spiked blood samples.

Samples	**1**	**2**	**3**	**4**
Added (nM)	5.0	10.00	20.00	40.00
Detected (nM)	5.13±0.75	9.87±1.98	21.29±1.25	38.75±2.21
Recovery (%)	102.6	98.7	106.4	96.9

Table S4 Comparison of analytical results for Hg^{2+} ions among different colorimetric methods.

Colorimetric method	**Linear ranges (nM)**	**LODs (nM)**
silver-melamine nanocomposite based method [1]	0.50 - 700	0.18
AuNPs@Tp-Bpy nanocomposite based method [2]	1.0 - 400	0.33
DNA-functionalized Au NPs based method [3]	100 - 2000	100
cysteine-modified Au-Ag nanorods based method [4]	1.0 - 60000	273
This work	**0.2 - 1000**	**0.085**

References

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