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Supplementary Information

In situ controllable growth of $CoFe_2O_4$ ferrite nanocubes on graphene for colorimetric detection of hydrogen peroxide

Jinhui Hao[a,b], Zhe Zhang[a], Wenshu Yang[a,b], Baoping Lu[a,b], Xi Ke[a,b], Bailin Zhang[a], and Jilin Tang[*a]

[a]State Key Laboratory of Electroanaytical Chemistry, Changchun Institute of Applied Chemistry, Chinese Academy of Sciences, Changchun 130022, (P. R. China)

E-mail: jltang@ciac.jl.cn; Fax: +86 431-85262734; Tel: +86 431-85262734

[b]Graduate School of the Chinese Academy of Sciences Beijing, 100039 (P.R. China)

Legends

Fig. S1 TEM images of rGO-IHO at low (A) and at high magnification (B).

Fig. S2 SEM images of rGO-CF at low (A) and at high magnification (B).

Fig. S3 TEM images of the production by using GO as precursor (A) and rGO-IHO as precursor (B) in the second step.

Fig. S4 TEM images of rGO-CF synthesized by varying the volume ratio of ethanol and water added in the reaction system. (A) 0:10, (B) 1:9, (C) 5:5, (D) 6:4, (E) 7:3, and (F) 10:0.

Fig. S5 (A) UV-vis spectra of TMB solution (black line), TMB-H_2O_2 (blue line), TMB-H_2O_2-CF (green line) and CF solution (red line) in pH 4.0 acetate buffer at room temperature. (B) UV-vis spectra of TMB solution (black line), TMB-H_2O_2 (blue line), TMB-H_2O_2-rGO-CF (green line) and rGO-CF solution (red line) in pH 4.0 acetate buffer at room temperature. Inset: photograph of aqueous dispersions of (a) TMB, (b) TMB-H_2O_2, (c) TMB-H_2O_2-rGO-CF, and (d) rGO-CF.

Fig. S6 Activity comparison of rGO-CF with different size. The rGO-CF was synthesized from different volume ratio of ethanol and water added in the reaction system. (A) 5:5, (B) 6:4, and (C) 7:3. Particle size: (A)＞(B)＞(C).

Fig. S7 Dependence of the peroxidase-like activity of rGO-CF on (A) pH, (B) temperature, and (C) H_2O_2 concentration. Experiments were carried out using 4 μg mL^{-1} rGO-CF or 0.5 ng mL^{-1} HRP in 1 mL of 0.2 M NaAc buffer with 200 μM TMB as substrate. The H_2O_2 concentration was 20 mM at pH 4.0 and 30 ℃ unless otherwise stated. The maximum point in each curve was set as 100 %.

Fig. S8 Steady-state kinetic assay and catalytic mechanism of rGO-CF (A-D).The velocity (v) of the reaction was measured using 4 μg mL^{-1} rGO-CF (A, B) or 0.5 ng mL^{-1} HRP (C, D) in 1 mL of 0.2 M NaAc buffer pH 4.0 at 30 ℃. Error bars shown represent the standard error derived from three repeated measurements. (A, C) The concentration of H_2O_2 was 20 mM (rGO-CF) or 0.8 mM (HRP) and the TMB concentration was varied. (B, D) The concentration of TMB was 100 μM and the H_2O_2 concentration was varied. (E, F)

Double-reciprocal plots of activity of rGO-CF at a fixed concentration of one substrate versus different concentration of the second substrate for H_2O_2 or TMB.

Fig. S9 The stability of the rGO-CF: (A) Activity comparison of rGO-CF and HRP after exposing to water/organic mixed solvents for 2 h at 30 ℃. The initial activity was set as 100 %. (B) Activity comparison of rGO-CF and HRP after incubating at different temperature for 2 h. The maximum point in each curve was set as 100 %.

Fig. S10 TEM images of rGO-CF before (A) and after (B) reacting with TMB and H_2O_2.

Table S1. Comparison of the apparent Km and Vmax between rGO-CF and HRP.

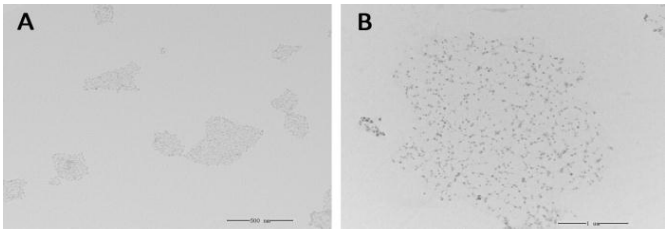


Fig. S1 TEM images of rGO-IHO at low (A) and at high magnification (B).

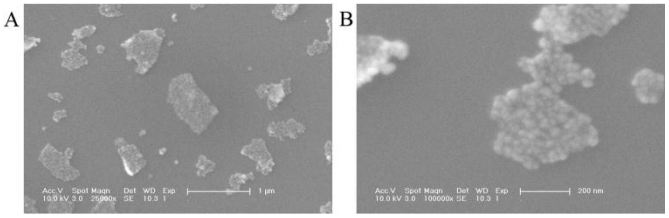


Fig. S2 SEM images of rGO-CF at low (A) and at high magnification (B).

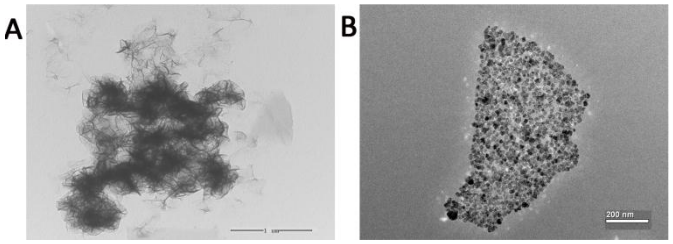
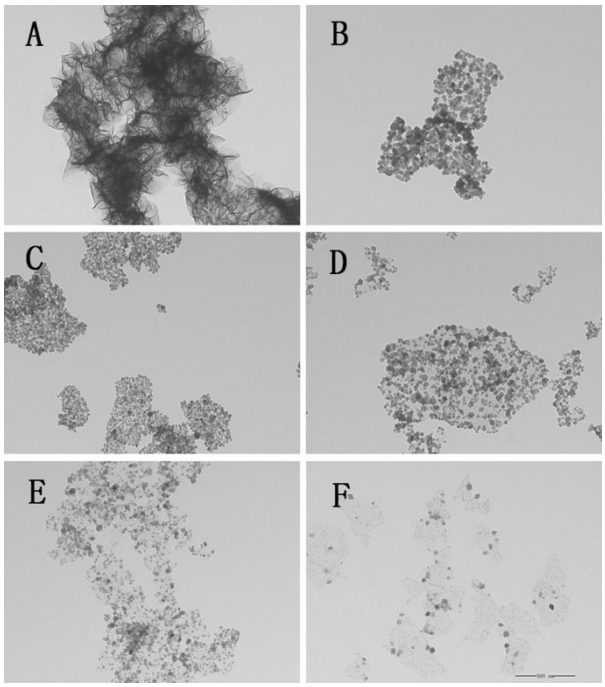


Fig. S3 TEM images: (A) GO as precursor. (B) rGO-IHO as precursor.



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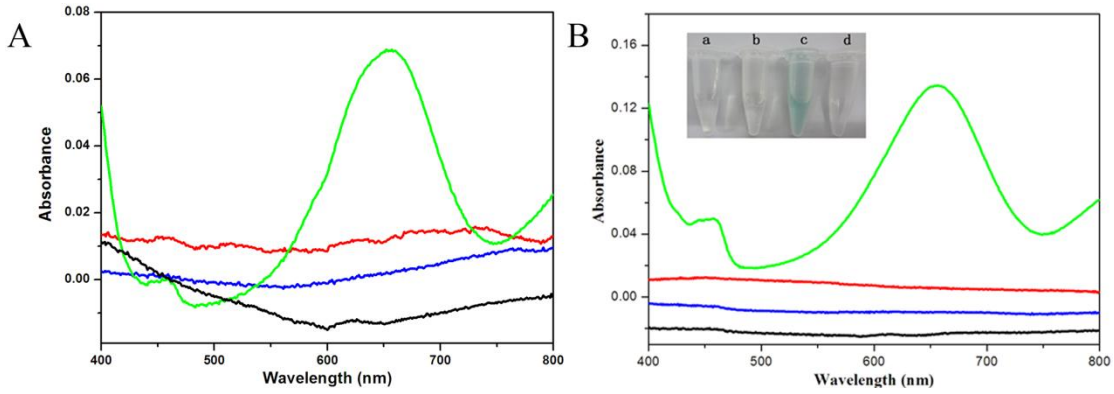

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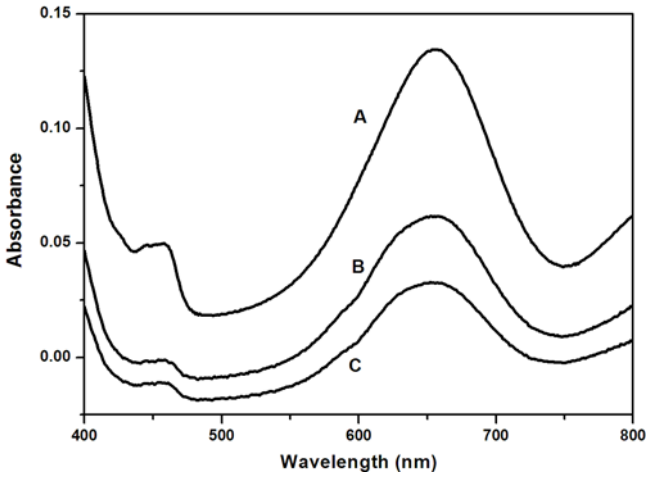

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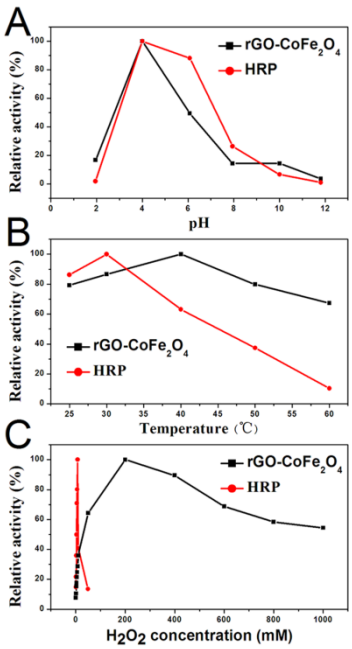

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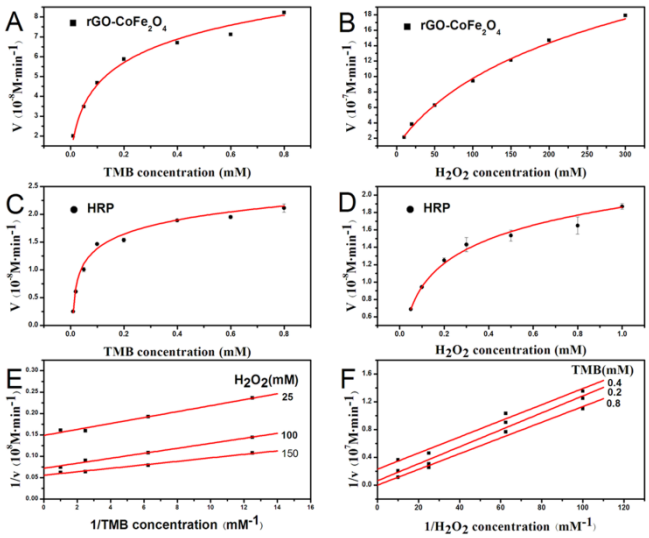

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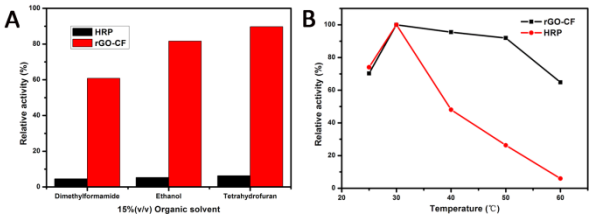

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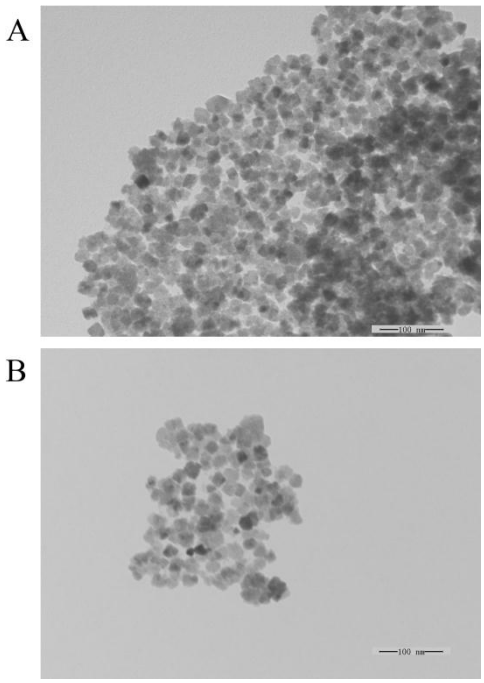

Fig. S10 TEM images of rGO-CF before (A) and after (B) reacting with TMB and H_2O_2.

Table S1. Comparison of the apparent K_m and V_{max} between rGO-CF and HRP.

Catalyst	Substance	K_m [mM][a]	V_{max} [10^{-8} M·s^{-1}][a]
rGO-CF	TMB	0.046±0.001	1.121±0.007
rGO-CF	H_2O_2	14.72±2.332	21.71±3.445
HRP	TMB	0.204±0.003	0.929±0.012
HRP	H_2O_2	0.171±0.048	0.356±0.004

[a]Mean value ± standard deviation (n=3).