Supporting Information

Two-dimensional FeP@C nanosheets as a robust oxidase mimic for fluorescence detection of cysteine and Cu^{2+}

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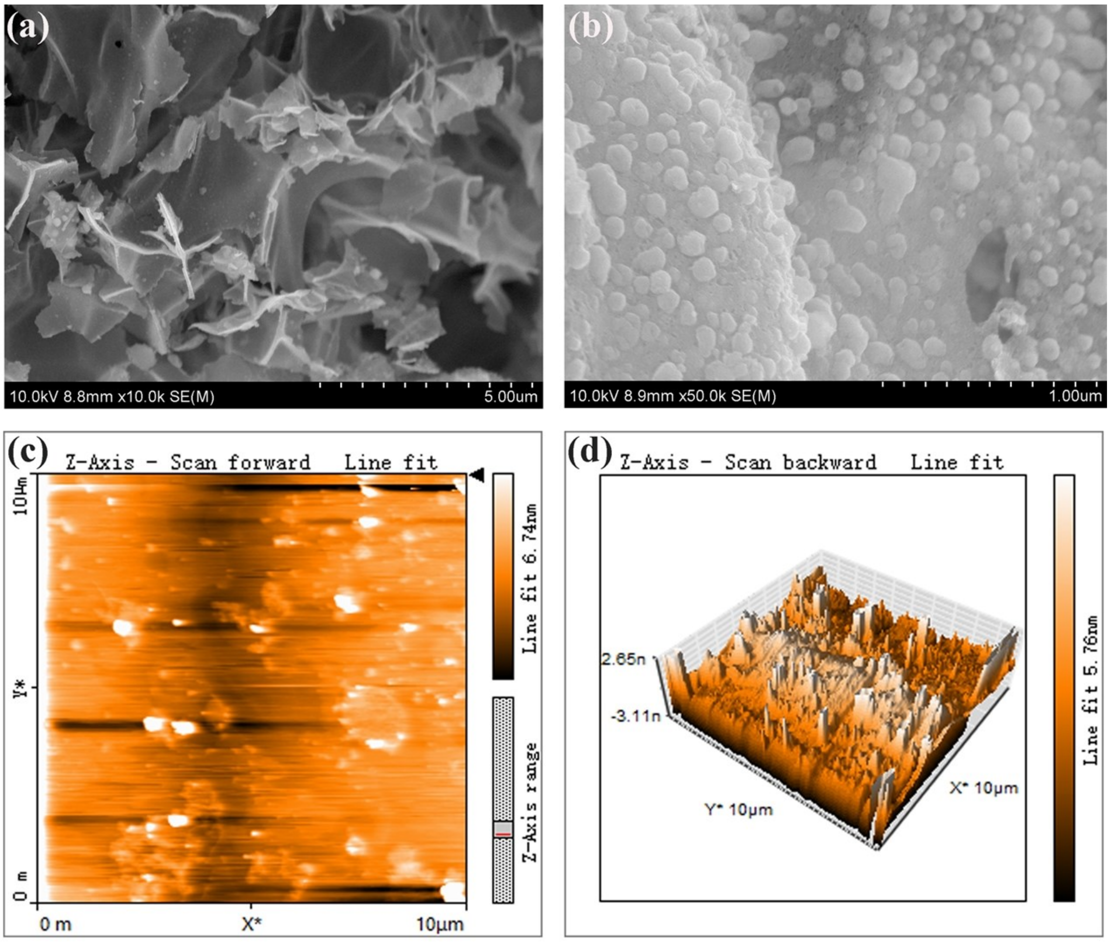

Figure S1. (a) and (b) Typical SEM images of Fe@C nanosheets. (c) AFM image of FeP@C nanosheets. (d) AFM 3D height profile of FeP@C nanosheets.

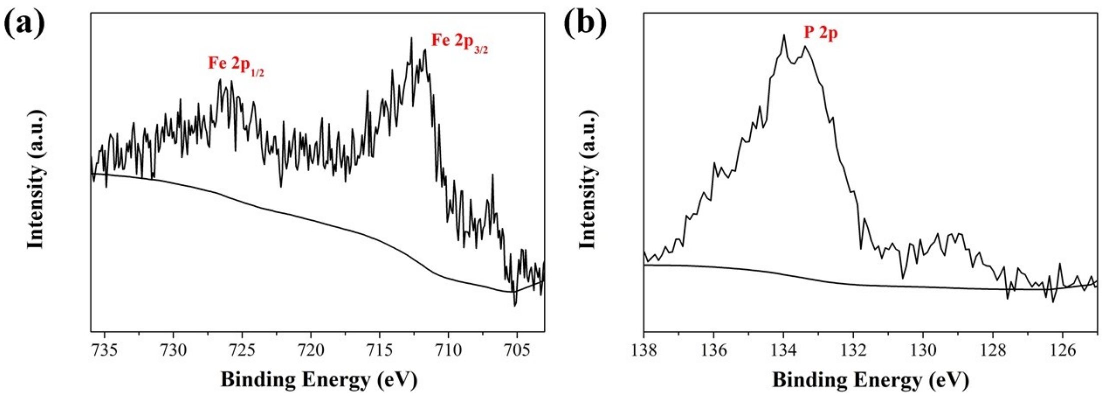

Figure S2. High-resolution XPS patterns for Fe 2p (a) and P 2p (b) regions of FeP@C nanosheets.

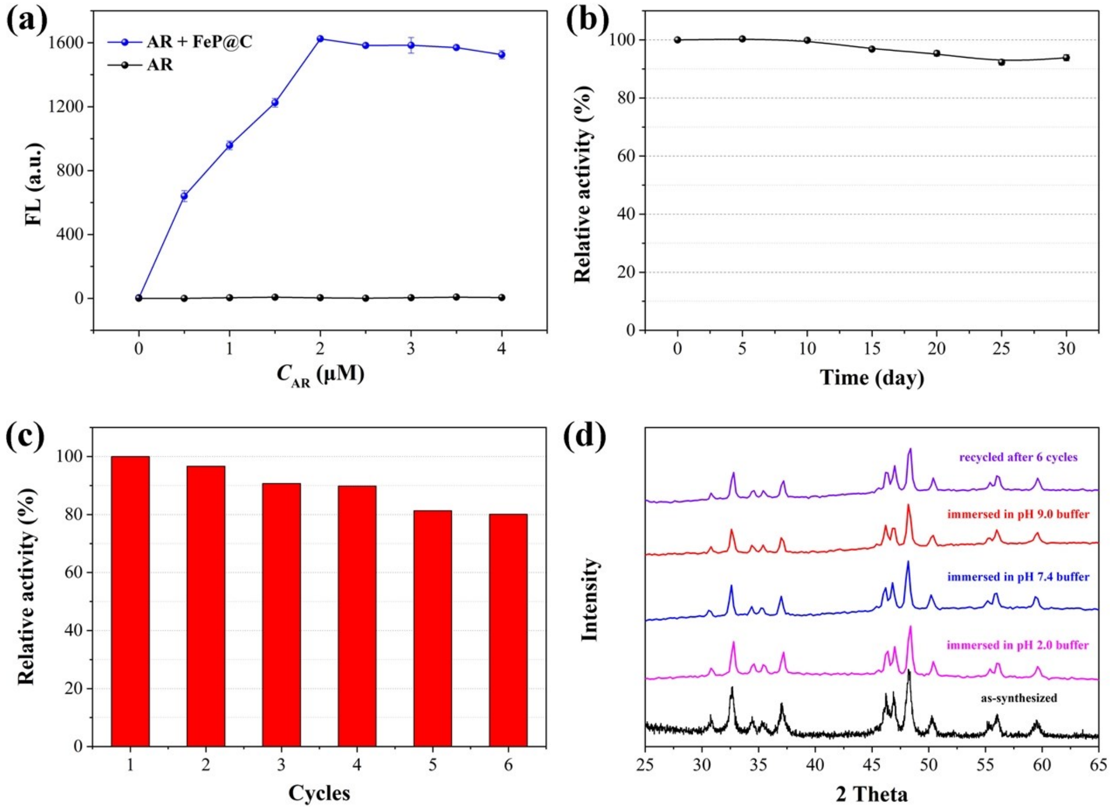

Figure S3. (a) Fluorescence signals at 585 nm of different concentration of AR with and without FeP@C nanosheets (50 mg L^{-1}). (b) The stability test of FeP@C nanozymes. (c) The reusability of FeP@C nanozymes. (d) PXRD patterns of the as-synthesized, immersed and recycled FeP@C nanosheets. The immersed FeP@C nanosheets were dispersed in Tris-HCl buffer of different pH for 30 min and then separated with filtration.

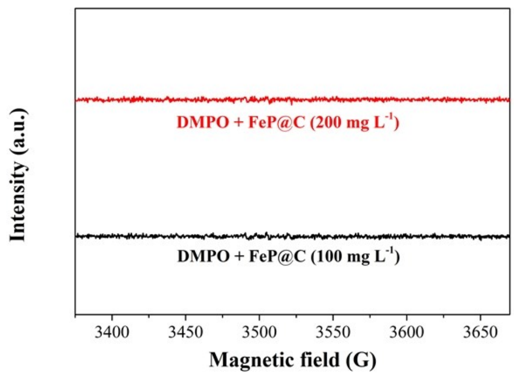

Figure S4. EPR spectra of FeP@C nanosheets with DMPO (100 mM).

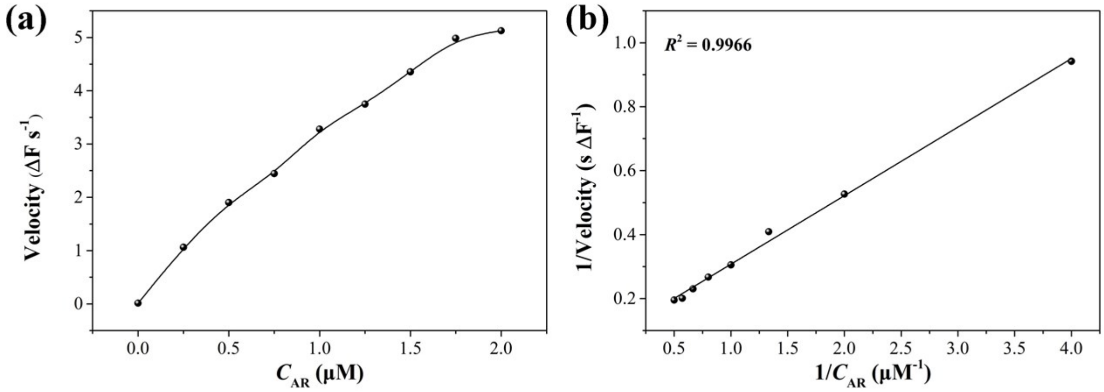

Figure S5. (a) Steady-state kinetic assay of the catalytic system of FeP@C nanosheets (5 mg L^{-1}). (b) Lineweaver-Burk plot of the double reciprocal of the Michaelis-Menten equation.

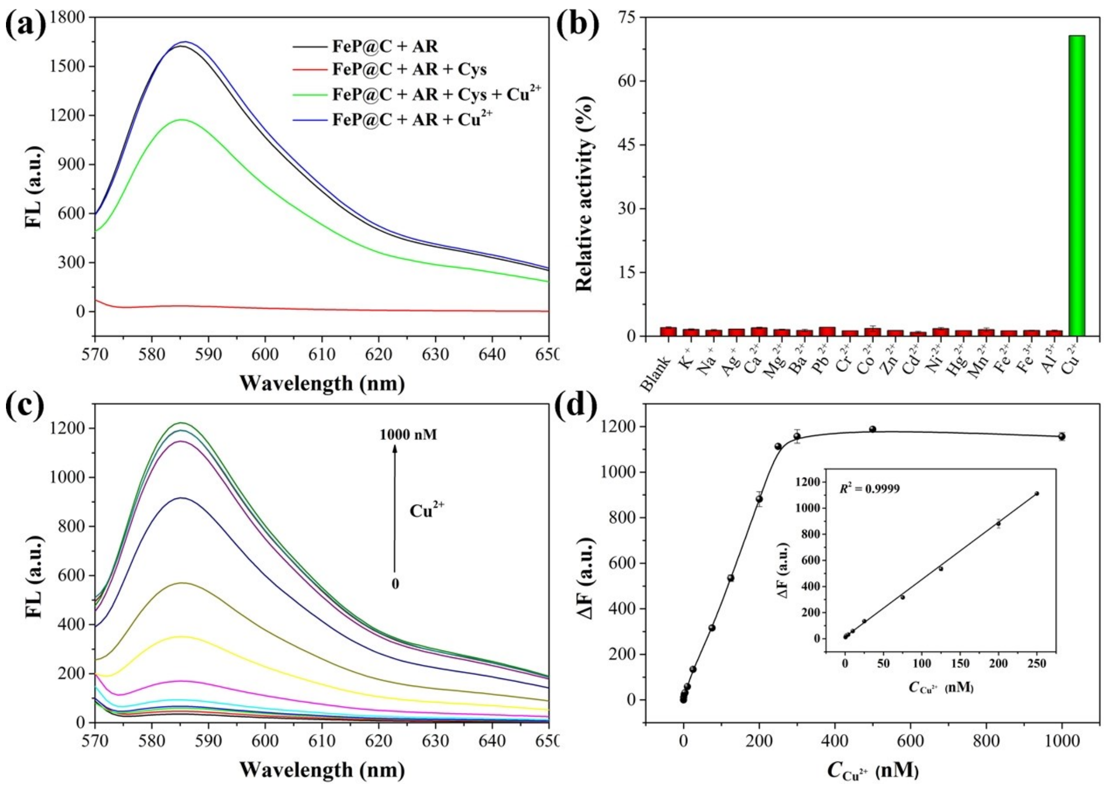

Figure S6. (a) Fluorescence emission spectra of FeP@C nanosheets (50 mg L^{-1}) and AR (2 μM) with and without Cys (80 μM) and Cu^{2+} (1 μM). (b) Selectivity of FeP@C sensing system for Cu^{2+} assay. The concentration of Cu^{2+} is 0.25 μM and the amounts of other mental ions are 1 μM. (c) Fluorescence emission spectra of the sensing system with different amount of Cu^{2+} (0, 0.5, 1.5, 4, 10, 25, 50, 75, 100, 125, 150, 200, 250, 300, 500, 1000 nM). (d) Cu^{2+} concentration-dependent change ($\Delta F = F-F_0$) in the fluorescence signal at 585 nm. Inset: the linear calibration plot for Cu^{2+} detection. F and F_0 are the fluorescence intensity of FeP@C nanosheets/AR/Cys system with and without Cu^{2+}, respectively.

Table S1. Comparison of different materials-based sensing platforms for Cys and Cu^{2+} detection.

Target	Methods	Linear range	Detection limit	Reference
	Fluorescence method based on two novel BODIPY-based fluorescent probes	0 ~ 50 μM	0.095 μM	1
	Colorimetric and near-infrared fluorescence method based on a naphthofluorescein probe	0 ~ 25 μM	0.18 μM	2
	Fluorescence method based on red emission nitrogen, boron, sulfur co-doped carbon dots	0.1 ~ 20 μM	0.045 μM	3
	Fluorescence method of an excited-state intramolecular proton transfer (ESIPT)-based aggregation-induced emission active probe	0 ~ 8 μM	0.084 μM	4
	Colorimetric method based on gold nanoparticles (Au-NPs)	0.17 ~ 1.7 μM	0.1 μM	5
Cys	Colorimetric method based on oxidase mimics of Ce-MOF	0 ~ 40 μM	0.14 μM	6
	Colorimetric method based on oxidase mimics of perovskite $LaMnO_{3+\delta}$ nanofibers	2 ~ 20 μM	0.11 μM	7
	Colorimetric method based on oxidase mimics of 9-Mesityl-10-Methylacridinium Ion	0.1 ~ 20 μM	0.10 μM	8
	Colorimetric method based on oxidase mimics of hollow $MnCo_2O_4$ nanofibers	0.5 ~ 10 μM	0.034 μM	9
	Fluorescence method based on oxidase mimics of Co-based metal organic frameworks (ZIF-67)	0.05 ~ 6 μM	0.031 μM	10
	Fluorescence method based on FeP@C nanosheets	**0.04 ~ 10 μM**	**0.026 μM**	**This work**
	Colorimetric and fluorescence method based on a rhodamine hydrazine probe	3 ~ 32.5 μM	86.8 nM	11
	Fluorescence method based on carbon dots (CDs)	0 ~ 10 μM	23 nM	12
	Fluorescence method based on ultrathin graphitic carbon nitride nanosheet ($g\text{-}C_3N_4$)	0 ~ 10 μM	0.5 nM	13
Cu^{2+}	Fluorescence method based on DNA oligonucleotide-stabilized silver nanoclusters (DNA-Ag NCs)	10 ~ 200 nM	8 nM	14
	Fluorescence method based on cubic mesoporous graphitic carbon (IV) nitride	10 ~ 100 nM	12.3 nM	15
	Colorimetric method based on oxidase mimics of nano-MnO_2	2 ~ 250 μM	< 2 μM	16
	Fluorescence method based on FeP@C nanosheets	**0.5 ~ 250 nM**	**0.21 nM**	**This work**

Table S2. Recoveries of Cys from serum sample without and with other 19 amino acids.

Samples	Cys (μM)				Recovery (%)
	Added	Recovered			
serum sample	0.50	0.53	0.53	0.52	105.20 ± 1.73
	2.0	2.00	1.89	1.83	95.31 ± 4.51
	3.0	3.03	3.17	2.82	100.24 ± 5.91
serum sample with other 19 amino acids	0.50	0.49	0.56	0.48	102.48 ± 8.78
	2.0	1.93	2.02	2.08	100.50 ± 3.68
	3.0	2.98	2.85	2.91	97.17 ± 2.15

Table S3. Recoveries of Cu^{2+} from three different mineral water samples.

Water samples	Cu^{2+} (nM)				Recovery (%)
	Added	Recovered			
Purified water[a]	25.0	25.9	26.4	25.3	103.43 ± 2.06
	75.0	74.0	73.9	74.3	98.78 ± 0.28
	150.0	147.2	144.6	152.9	98.80 ± 2.84
Spring water[b]	25.0	25.2	25.0	25.3	100.76 ± 0.59
	75.0	75.9	77.2	78.2	102.78 ± 1.54
	150.0	158.4	156.8	157.0	104.93 ± 0.57
Tap water	25.0	26.4	24.2	25.5	101.41 ± 4.26
	75.0	72.8	75.4	75.1	99.24 ± 1.94
	150.0	149.3	155.8	149.8	101.07 ± 2.40

[a] Obtained from commercial 'Wahaha' purified drinking water.

[b] Obtained from commercial 'Nongfu' spring drinking water.

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