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Supplementary Materials

Dual-Functional Peroxidase-Copper Phosphate Hybrid Nanoflowers for Sensitive Detection of Biological Thiols

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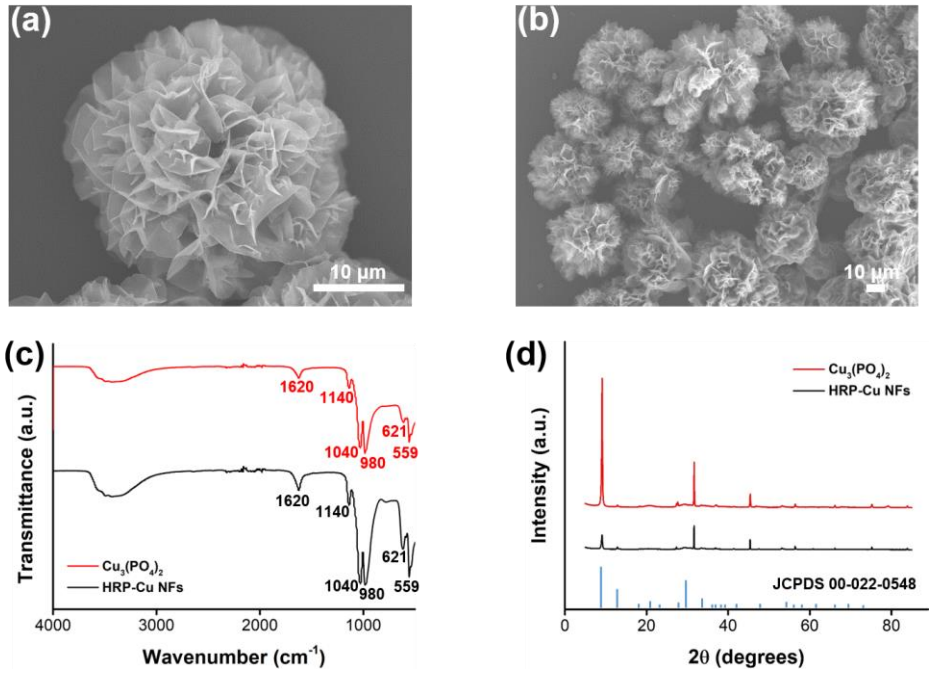

Figure S1. SEM images with a) high magnification and b) low magnification, c) FT-IR spectra, and d) XRD patterns of HRP-Cu NFs.

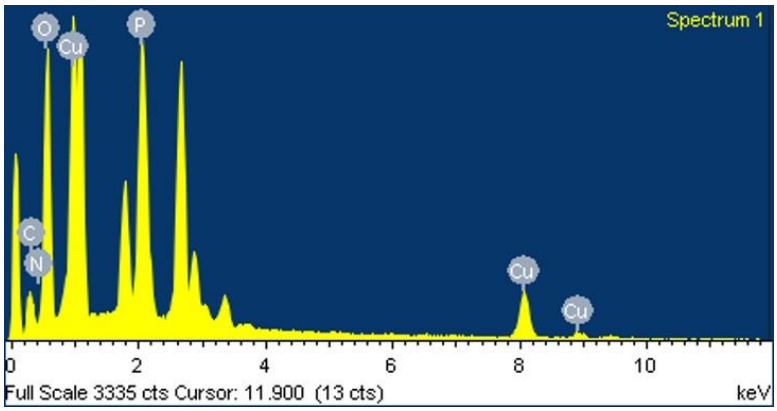

Figure S2. EDS analysis of HRP-Cu NFs.

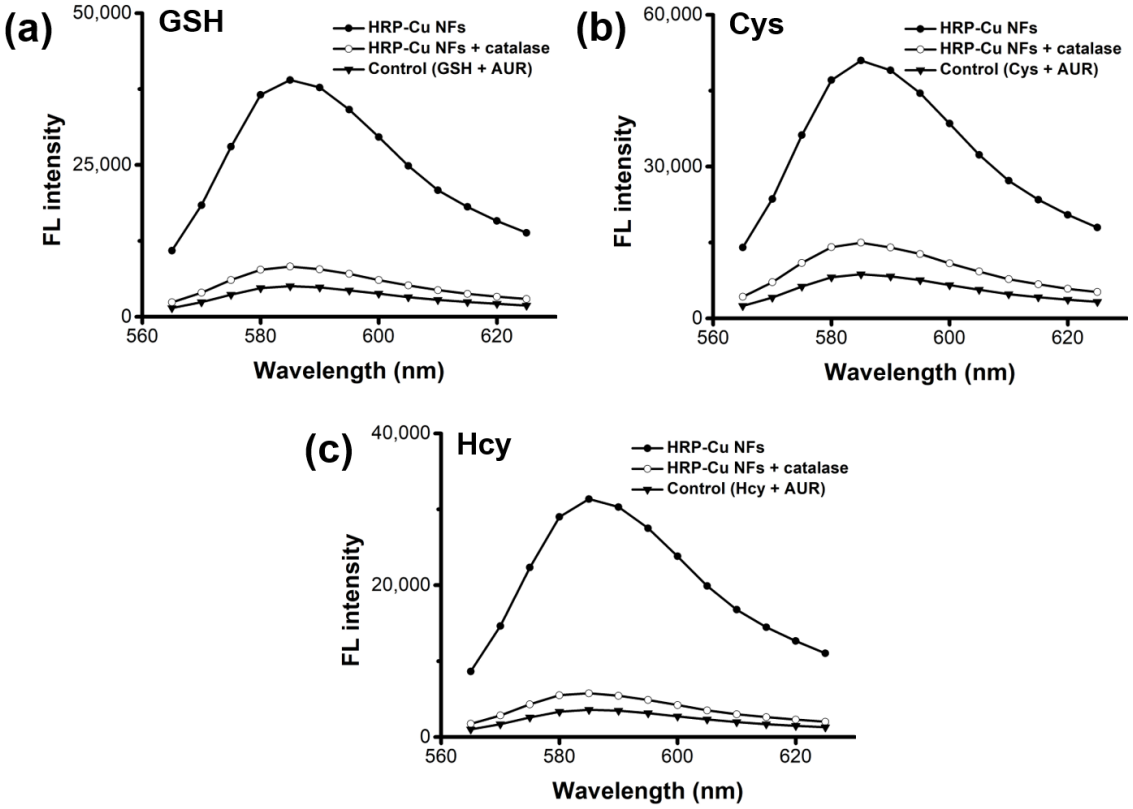

Figure S3. Demonstration for H_2O_2 generation from HRP-Cu NFs-mediated biothiol oxidation via the addition of catalase.

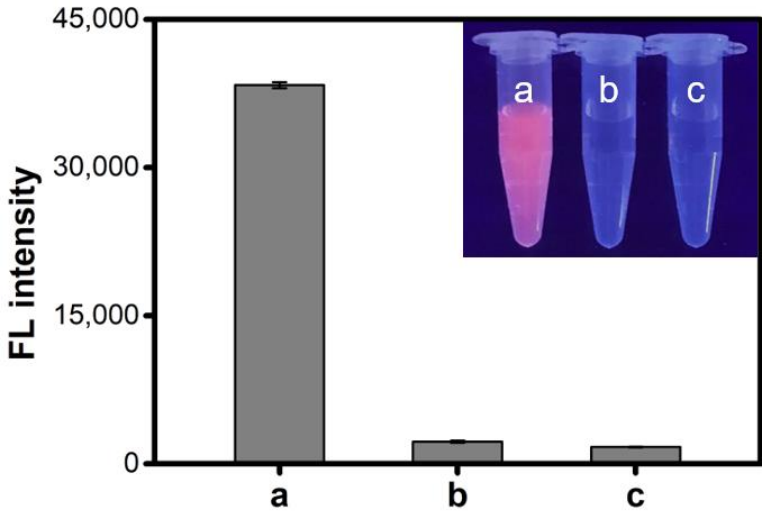

Figure S4. Fluorescence intensities from AUR oxidation in the presence of GSH catalyzed by a) HRP-Cu NFs, b) supernatant solution separated from HRP-Cu NFs, and c) negative control. The supernatant solution was collected by first incubating HRP-Cu NFs (1 mg/mL) in sodium phosphate buffer (800 μL, 10 mM, pH 7.4) for 15 min, followed by centrifugation (10,000 rpm, 1 min).

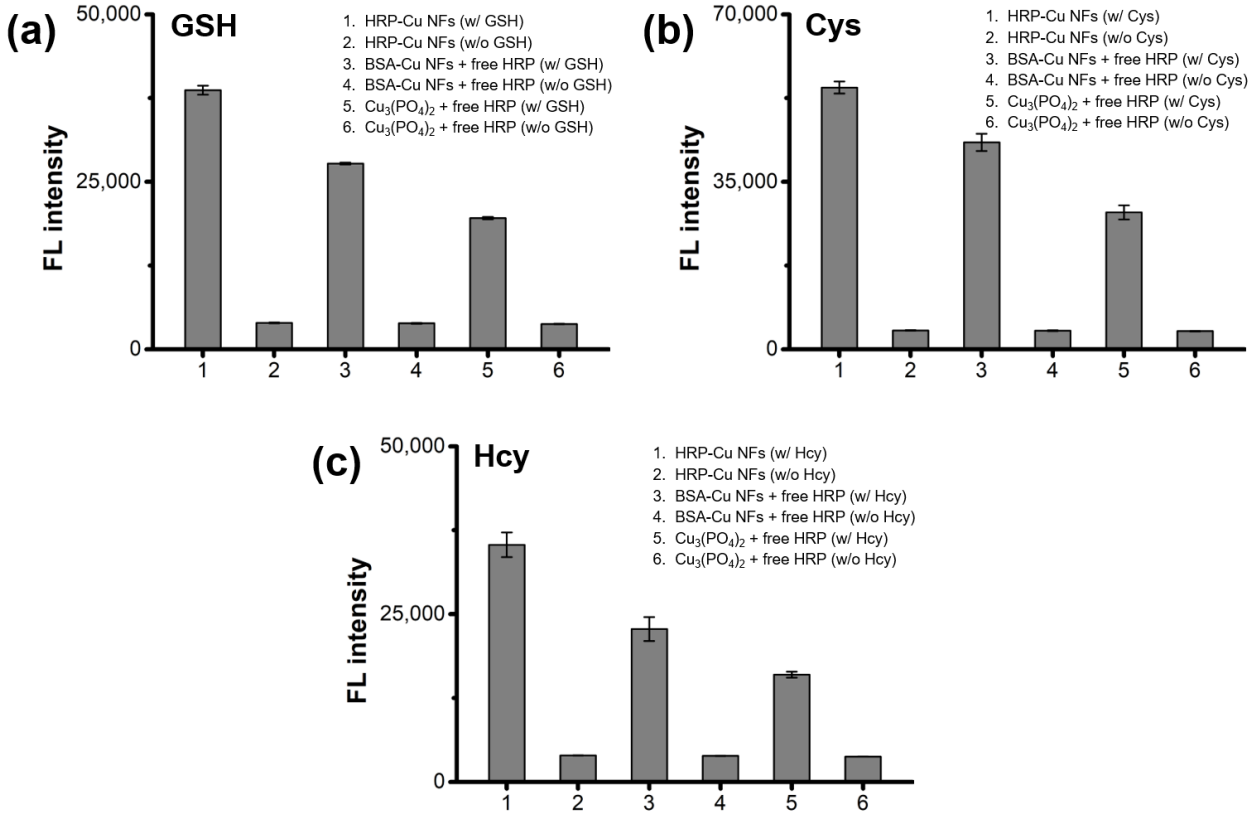

Figure S5. Fluorescence intensities from AUR oxidation promoted by HRP-Cu NFs, BSA-Cu NFs + free HRP, and $Cu_3(PO_4)_2$ precipitates + free HRP in the presence and absence of a) GSH, b) Cys, and c) Hcy.

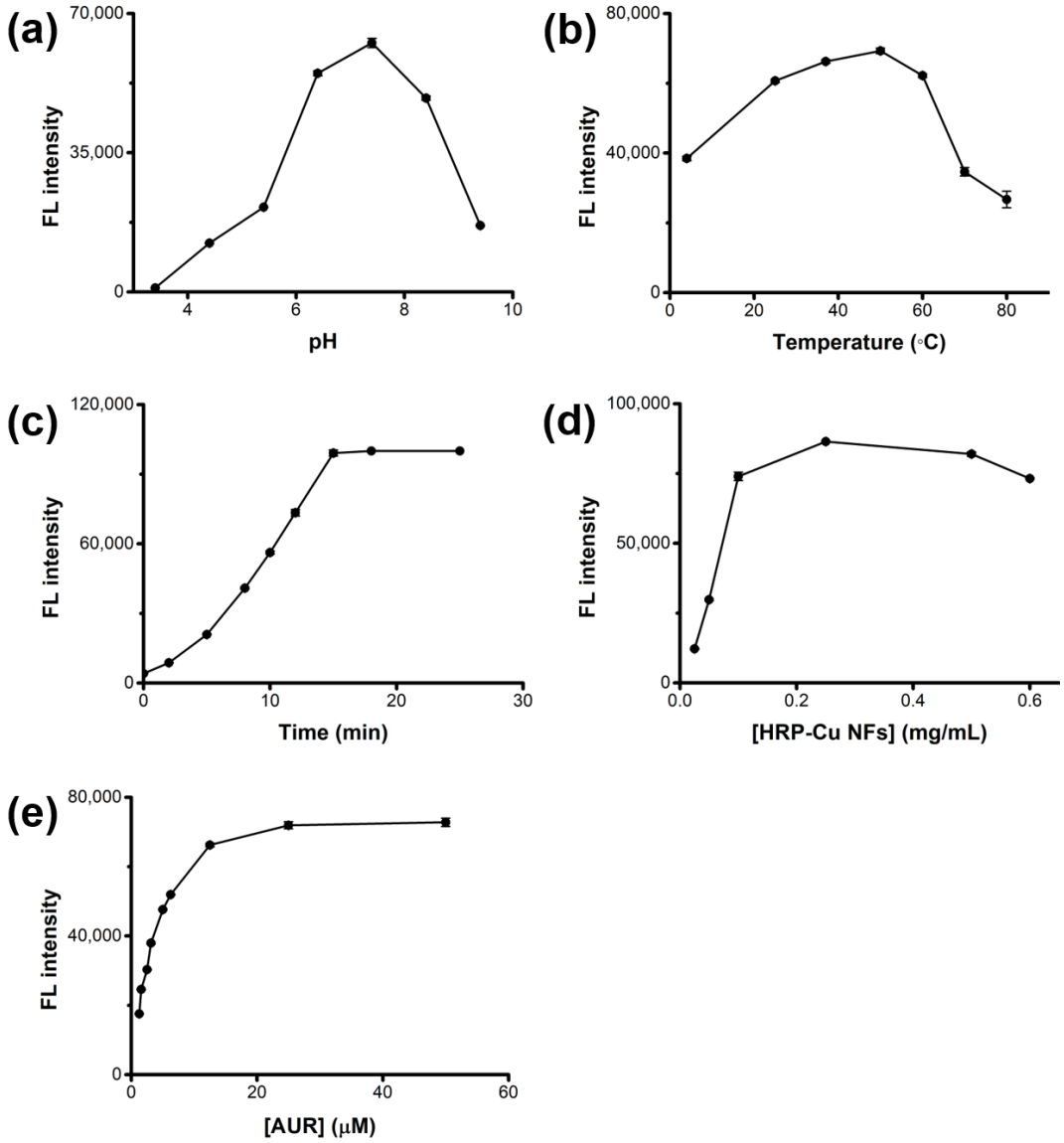

Figure S6. Effects of different reaction conditions on GSH detecting activity of HRP-Cu NFs. a) pH, b) temperature, c) reaction time, and the concentrations of d) HRP-Cu NFs and e) AUR.

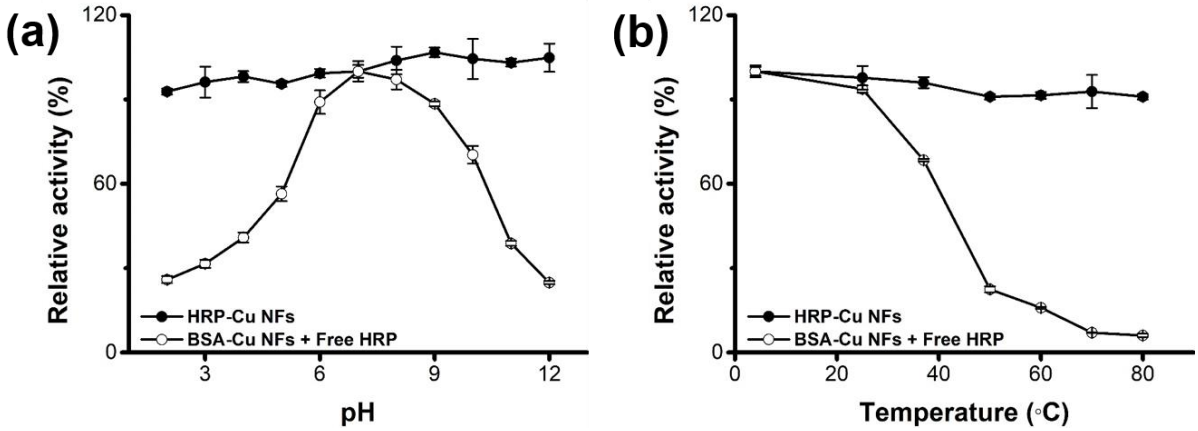

Figure S7. Comparison of a) pH and b) thermal stabilities between HRP-Cu NFs and control system comprising BSA-Cu NFs with free HRP.

Table S1. Comparison of the analytical sensitivities of HRP-Cu NFs-based assay for the determination of GSH, Cys, and Hcy with those of recent reports.

	Method	Linear range (μM)	LOD (μM)	Reference
GSH	Cyclic voltammetry	$0.3 – 3.5 \times 10^3$	0.300	[1]
	Amperometry	$857 - 4.1 \times 10^3$	5.000	[2]
	Colorimetry	1 - 25	0.300	[3]
	Fluorometry	0.1 - 20	0.032	[4]
	Fluorometry	1 - 10	0.300	[5]
	Fluorometry	0.1 - 1.0	13.4×10^{-3}	Present study
Cys	Amperometry	5 - 60	1.5	[6]
	Amperometry	$5 - 12.6 \times 10^3$	3.64	[7]
	Colorimetry	0.05 - 10	0.1	[8]
	Colorimetry	1.5 - 6	0.05	[9]
	Fluorometry	0.1 - 100	0.08	[10]
	Fluorometry	1.0 - 110	0.16	[11]
	Fluorometry	0.1 - 1.0	4.5×10^{-3}	Present study
Hcy	Amperometry	10 - 80	6.9	[12]
	Amperometry	5 - 200	4.6	[13]
	Colorimetry	0.5 - 3.0	0.5	[14]
	Fluorometry	0 - 25	1.88	[15]
	Fluorometry	0.1 - 1.0	18.3×10^{-3}	Present study

Table S2. Determination of GSH in spiked human serum at different dilution factors using HRP-Cu NFs-based assay system.

Dilution factor	Original biothiols (μM)	Added (μM)	Expected (μM)	Measured (μM)	Recovery (%)	CV (%)
1000	0.404	0	0.404	0.397	98.28	3.81
		0.125	0.529	0.533	100.73	2.17
		0.25	0.654	0.639	97.78	1.24
		0.5	0.904	0.862	95.35	1.27
500	0.872	0	0.872	0.834	95.61	2.00
		0.125	0.997	0.913	91.61	0.29
		0.25	1.122	0.938	83.1	1.84
		0.5	1.372	1.116	81.33	5.10

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