

Supporting Information

Self-Assembled Peptide Hydrogel as a Smart Biointerface for Enzyme-Based Electrochemical Biosensing and Cell Monitoring

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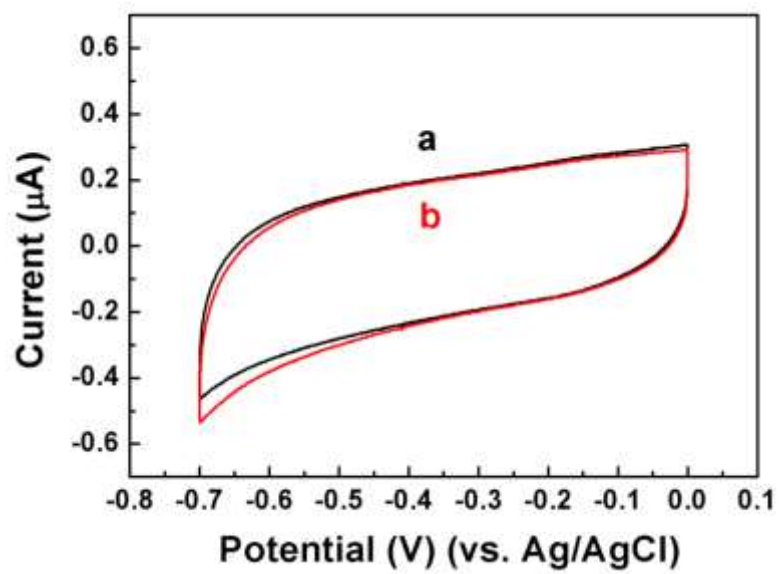


Figure S1. CVs of the Fmoc-FF hydrogel/GCE with (a) 0, (b) 30 μM H_2O_2 in 0.1 M PBS (pH 7.0) at a scan rate of 0.1 V s^{-1} .

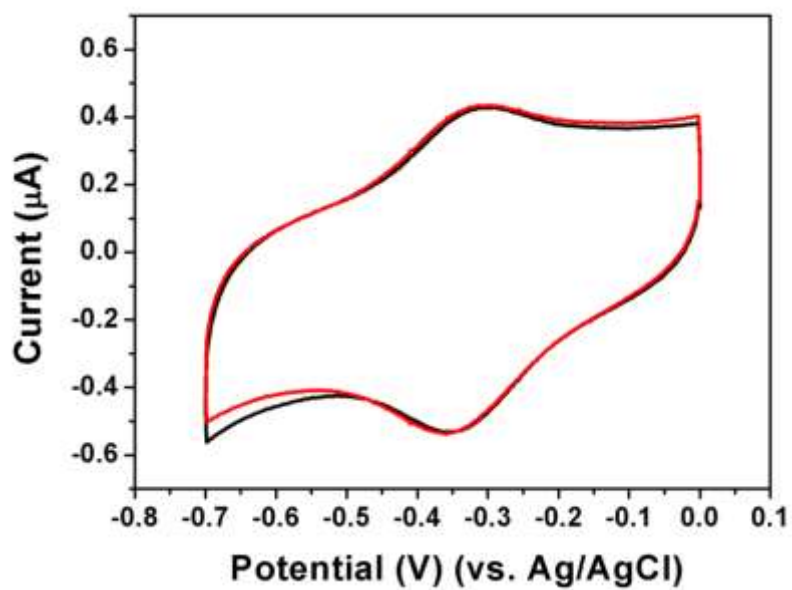


Figure S2. CVs obtained at the HRP/Fmoc-FF hydrogel/GCE in 0.1 M PBS (pH 7.0) before (black line) and after (red line) continuous scanned for 100 cycles. Scan rate: 0.1 V s^{-1} .

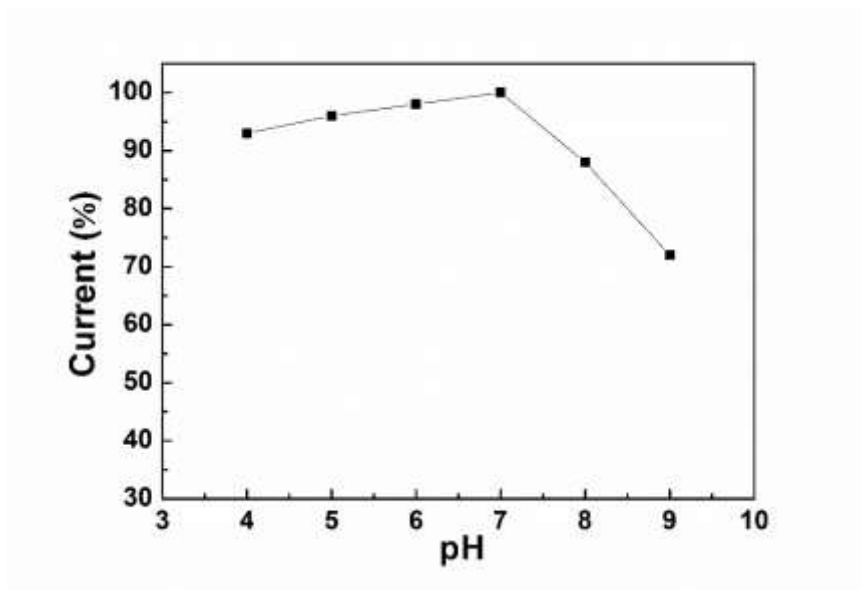


Figure S3. Effect of solution pH on the electrocatalytic responses of the HRP/Fmoc-FF hydrogel/GCE with 10 μM H_2O_2 in 0.1 M PBS at -0.35 V vs. Ag/AgCl.

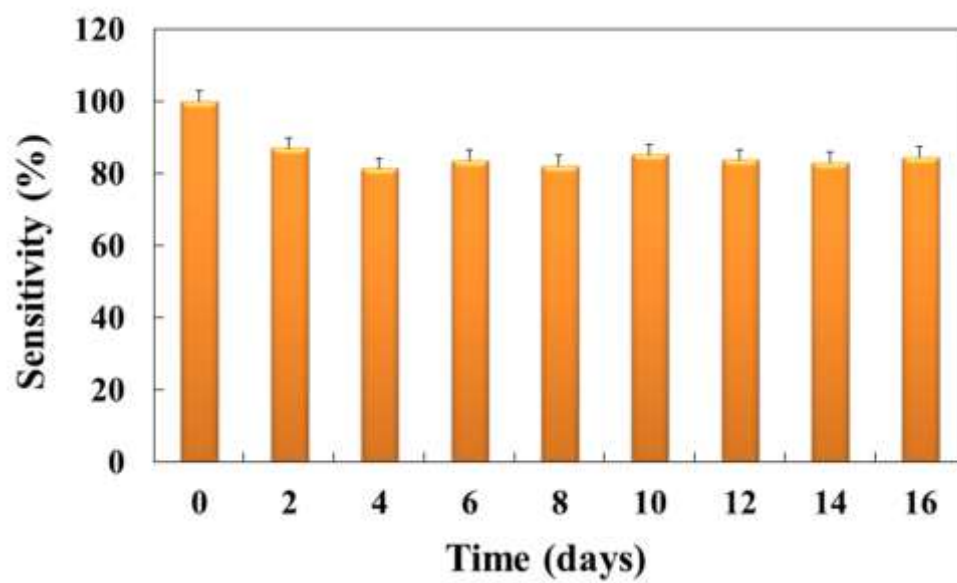


Figure S4. Stability test for the HRP/Fmoc-FF hydrogel/GCE at -0.35 V vs. Ag/AgCl in 0.1 M PBS (pH 7.0) over 2 weeks.

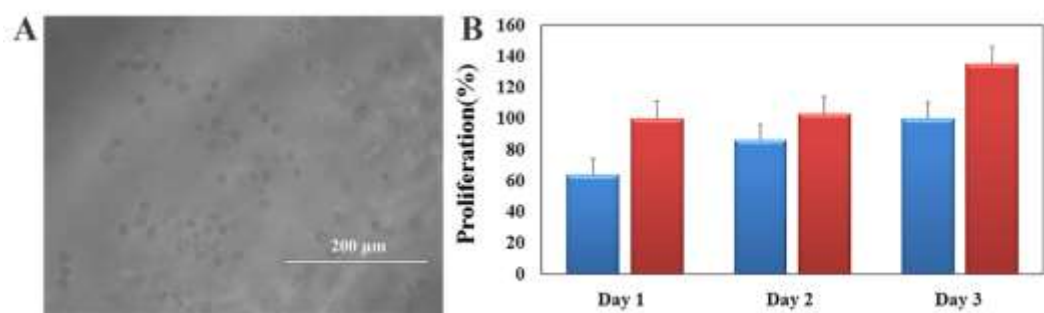


Figure S5. (A) HeLa cells cultured above the surface of the Fmoc-FF peptide hydrogel, scale bar represents 200 μm . (B) Cell proliferation based on an MTT assay within the Fmoc-FF hydrogel (red), and the tissue culture plastic control (blue).

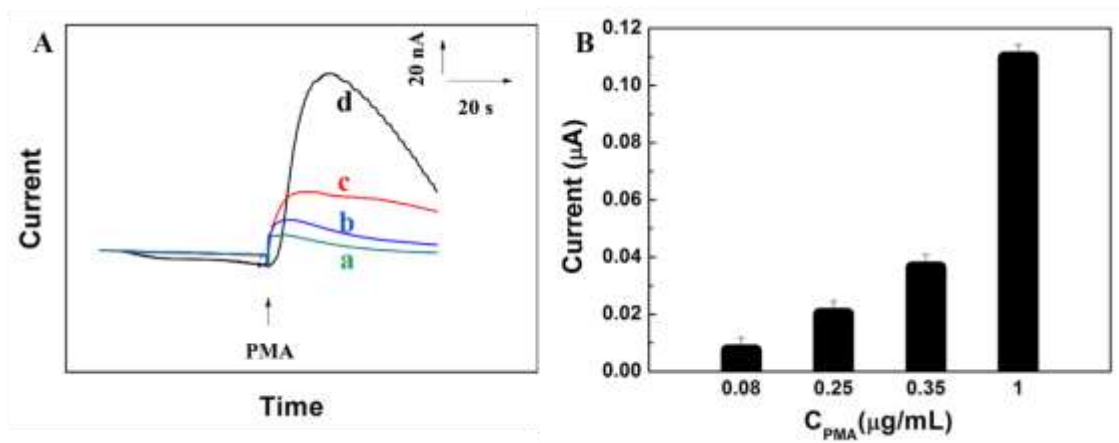


Figure S6. (A) Amperometric responses of the HRP/Fmoc-FF hydrogel/GCE with HeLa cells (3×10^4 cells) on the surface of the modified electrode induced by (a) 0.08, (b) 0.25, (c) 0.35 and (d) $1 \mu\text{g mL}^{-1}$ PMA in 0.1 M PBS (pH 7.0) at -0.35 V vs. Ag/AgCl. (B) The increase of the peak current obtained at the HRP/Fmoc-FF hydrogel/GCE with HeLa cells (3×10^4 cells) on the surface of the modified electrode induced by different concentration of PMA.

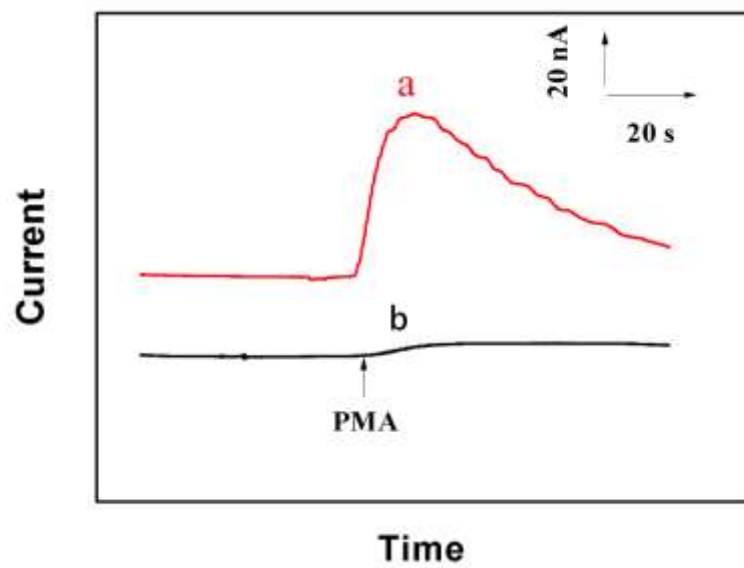


Figure S7. Amperometric responses of the HRP/Fmoc-FF hydrogel/GCE induced by PMA ($1 \mu\text{g mL}^{-1}$) in 0.1 M PBS (pH 7.0) at -0.35 V vs. Ag/AgCl, in the presence (a) and absence (b) of Hela cells (2×10^6 cells) in measured solutions.

Table S1. Comparison of the proposed H₂O₂ biosensor with other HRP-based direct electrochemical biosensors.

Different modified electrodes	Linear range (μM)	Detection limit (μM)	Reference
HRP/Fmoc-FF hydrogel/GCE	0.1– 60.2	0.018	this work
HRP-agarose/EPG	4.2– 60.4		(1)
HRP-PNM hydrogel/GCE	0.19–1.35	0.0475	(2)
HRP/chitosan/sol-gel/CNT/GCE	4.8–5000	1.4	(3)
HRP-loaded PHC hydrogel/ITO	1–1000	0.5	(4)
HRP/Ni-Al-LDHNS/GCE	0.6–192	0.4	(5)
HRP/TiO ₂ -48/Nafion/GCE	0.4–140	0.05	(6)
HRP/Ag@C/ITO	0.5–140	0.2	(7)
HRP/C-Dots/LDHs/GCE	0.1–23.1	0.04	(8)

PNM, poly (N-isopropylacylamide-co-3-methacryloxypropyltrimethoxy silane); CNT, carbon nanotubes; PHC, polyhydroxyl cellulose; LDHNS, layered double hydroxide nanosheets.

The number of extracellular H₂O₂ molecule released per cell (N_0) can be calculated according to: $N_0 = \{[\Delta R \div (k \times A) \times V] \times N_A\} \div \{\varepsilon \times A\}$, where ΔR is current response, k is sensitivity of the sensing platform, A is electrode surface area, V is volume of electrolyte, N_A is the Avogadro constant (6.02×10^{23} /mole), and ε is cell density.⁸ With known current response of 109.7 nA (curve a of Figure 5B), a sensitivity of $0.29 \mu\text{A } \mu\text{M}^{-1} \text{ cm}^{-2}$, electrode surface area of 7.07 mm^2 , and cell density of 4243 mm^{-2} , as well as the volume of the electrolyte (1 mL), N_0 is calculated to be around 10^{11} .

References:

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