

Electronic Supporting Information (ESI)

**Electrochemical reduction of hydrogen peroxide by nanostructured hematite
modified electrodes**

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Table S1 Summary of values of I_{pc} and E_{pc} of the FTO and nanostructured α - Fe_2O_3 electrodes.

	Sample			
	FTO	α - Fe_2O_3 _{3NR}	α - Fe_2O_3 _{3NS}	α - Fe_2O_3 _{3NP}
J_{pc}^a (mA cm ⁻²)	-0.933	-0.900	-1.027	-1.102
E_{pc}^b (V vs. Ag/AgCl)	-0.558	-0.424	-0.404	-0.374

^a: cathodic peak current density; ^b: cathodic peak potential. All parameters are determined in Na₂SO₄ solution (pH 7) containing 4.95 mM H₂O₂.

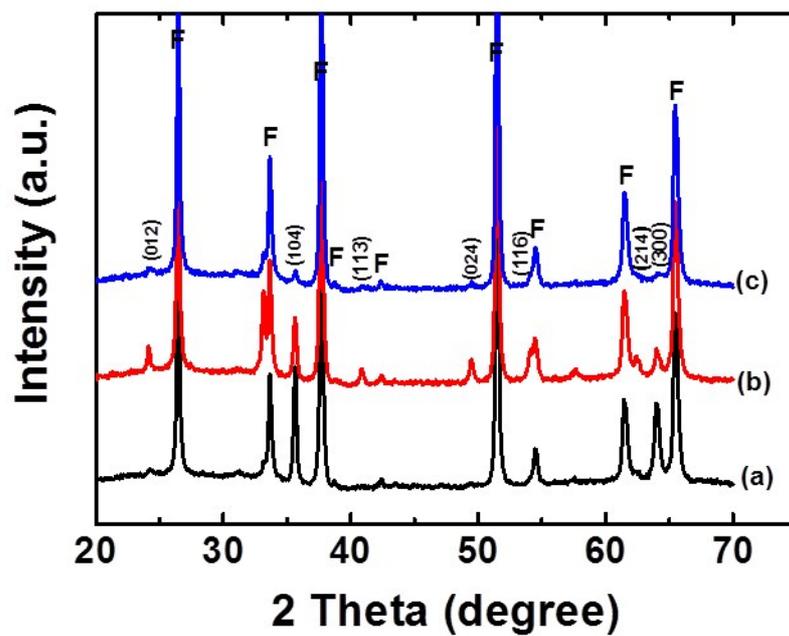


Figure S1 XRD patterns of (a) α -Fe₂O_{3NR}, (b) α -Fe₂O_{3NS}, and (c) α -Fe₂O_{3NP}.

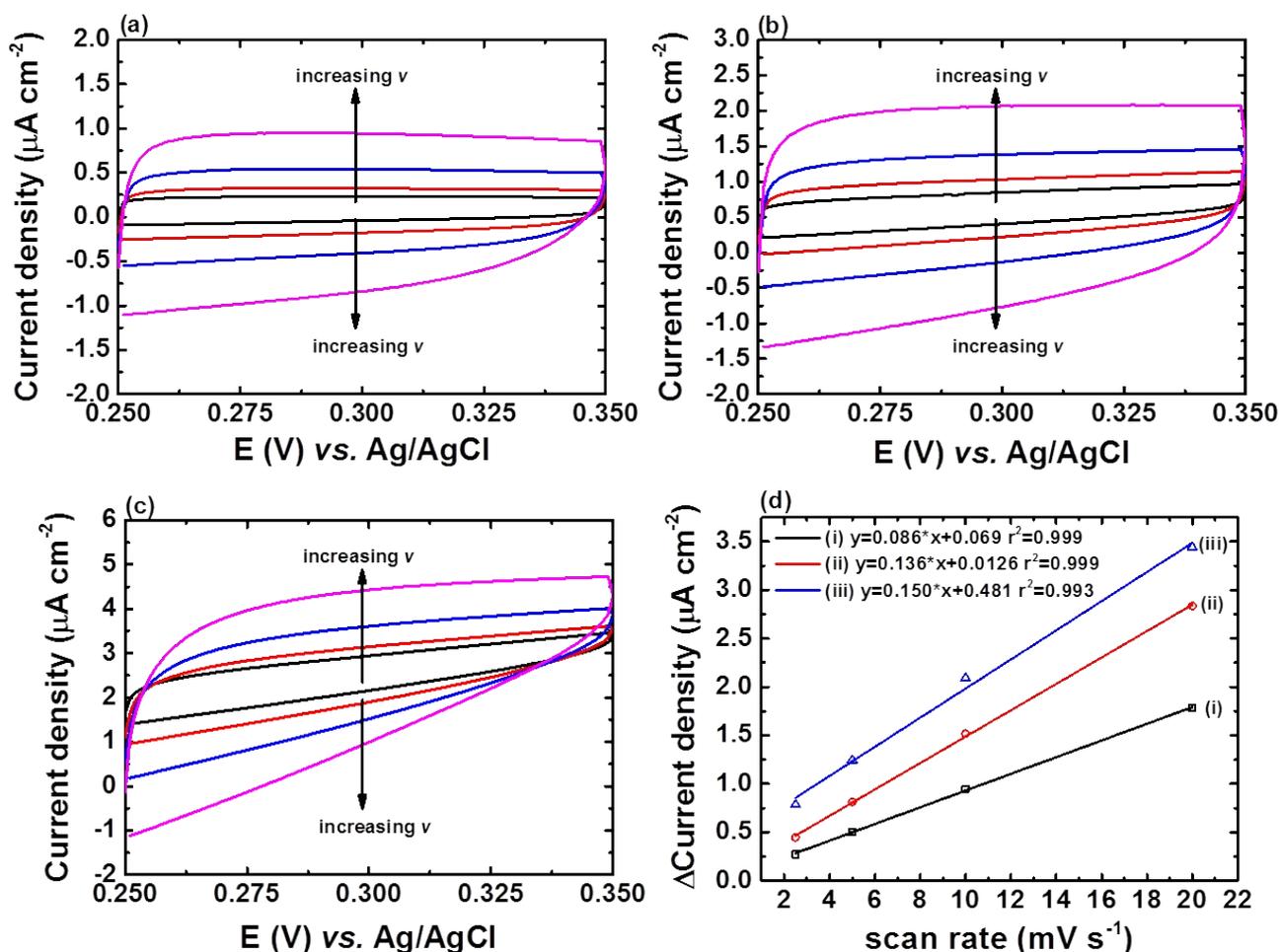


Figure S2 CVs of (a) $\alpha\text{-Fe}_2\text{O}_{3\text{NR}}$, (b) $\alpha\text{-Fe}_2\text{O}_{3\text{NS}}$, and (c) $\alpha\text{-Fe}_2\text{O}_{3\text{NP}}$ modified electrodes recorded at various scan rates (v), including 2.5, 5, 10, and 20 mV s^{-1} , in 0.1 M Na_2SO_4 electrolyte (pH 7). The plots of \square current density vs. v , where the \square current density is the sum of the anodic current and cathodic current measured at 0.3 V vs. Ag/AgCl from (a), (b), and (c), are shown in (d). The capacitances of the nanostructured $\alpha\text{-Fe}_2\text{O}_3$ were then estimated from the slope of the curve of charging current density vs. v (c), where the slope is equal to $2C_{\text{dl}}$. However, since the area-averaged capacitance of $\alpha\text{-Fe}_2\text{O}_3$ is unknown, the relative effective surface area, i.e., the normalized slopes of curves in (d) with respect to curve (i), is calculated instead of actual effective surface area. As revealed in (d), the relative surface area of $\alpha\text{-Fe}_2\text{O}_{3\text{NR}}$, $\alpha\text{-Fe}_2\text{O}_{3\text{NS}}$, and $\alpha\text{-Fe}_2\text{O}_{3\text{NP}}$ is found as 1.00: 1.58: 1.74.

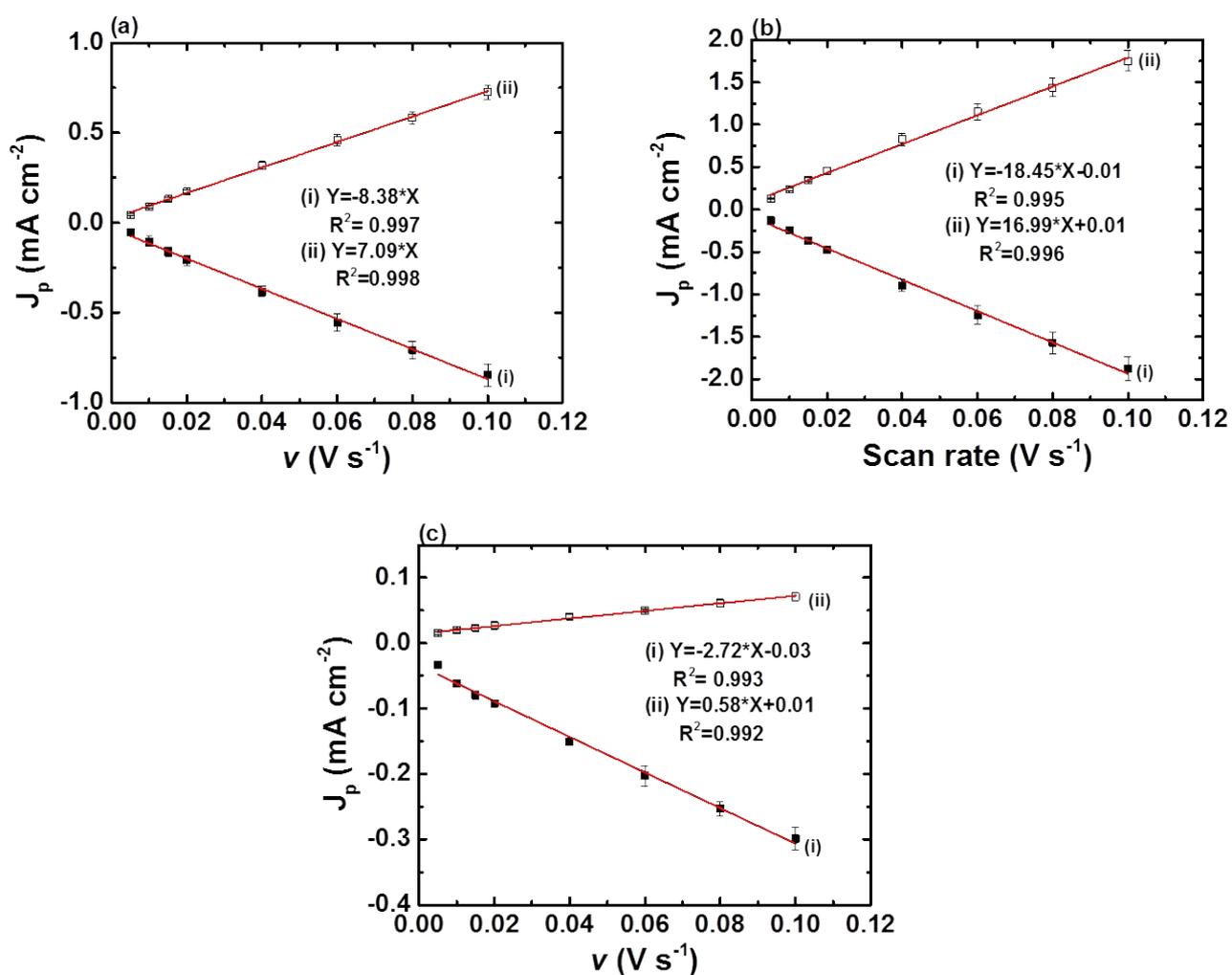


Figure S3 Plots of peak current density (J_p) vs. scan rate for the pretreated (a) α - $\text{Fe}_2\text{O}_{3\text{NR}}$, (b) α - $\text{Fe}_2\text{O}_{3\text{NS}}$, and (c) α - $\text{Fe}_2\text{O}_{3\text{NP}}$ in 0.1 M PBS (pH 7) under N_2 atmosphere.

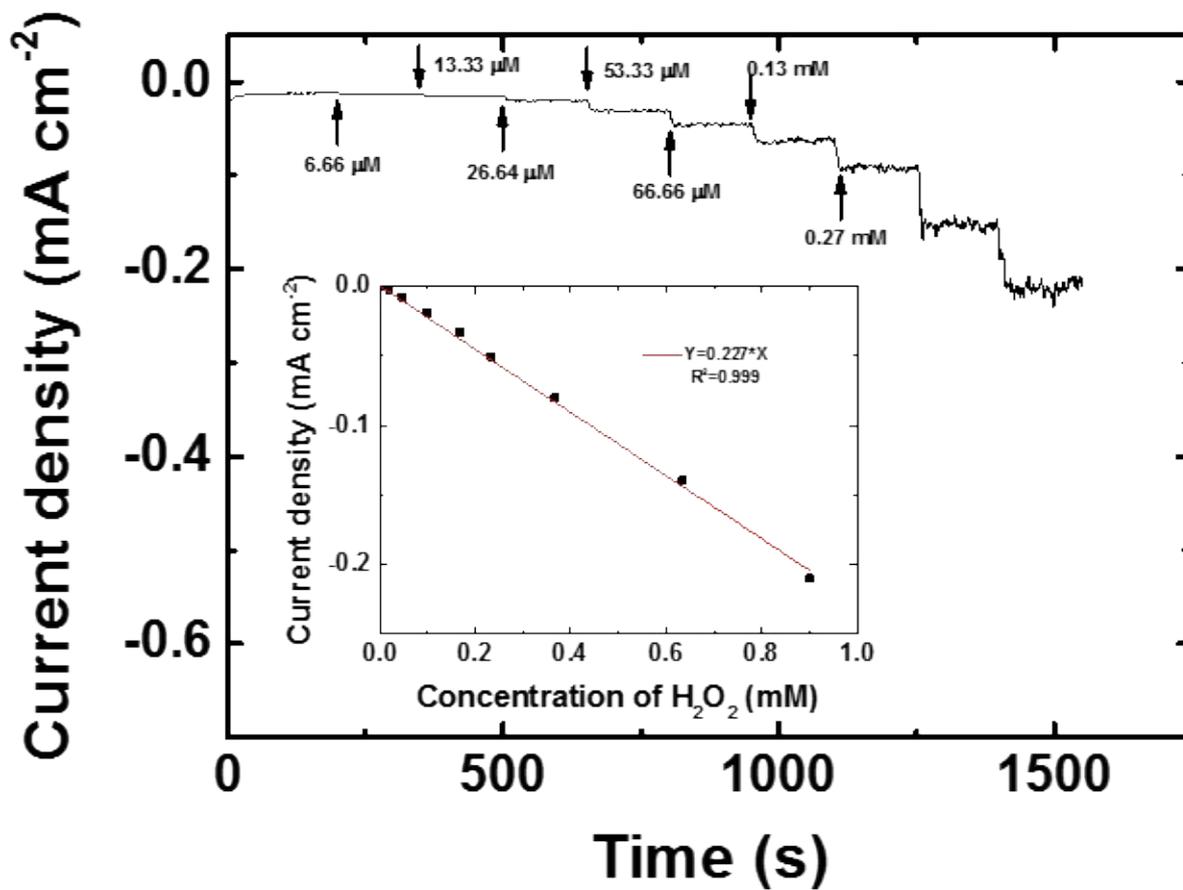


Figure S4 I-t transient of the $\alpha\text{-Fe}_2\text{O}_3\text{NS}|\text{FePO}_4$ electrode recorded at an applied potential of -0.3 V vs. Ag/AgCl on successive additions of the H_2O_2 solution of different concentrations into the deaerated 0.1 M PBS (pH 6). Inset: calibration curve for current density versus concentration of H_2O_2 .

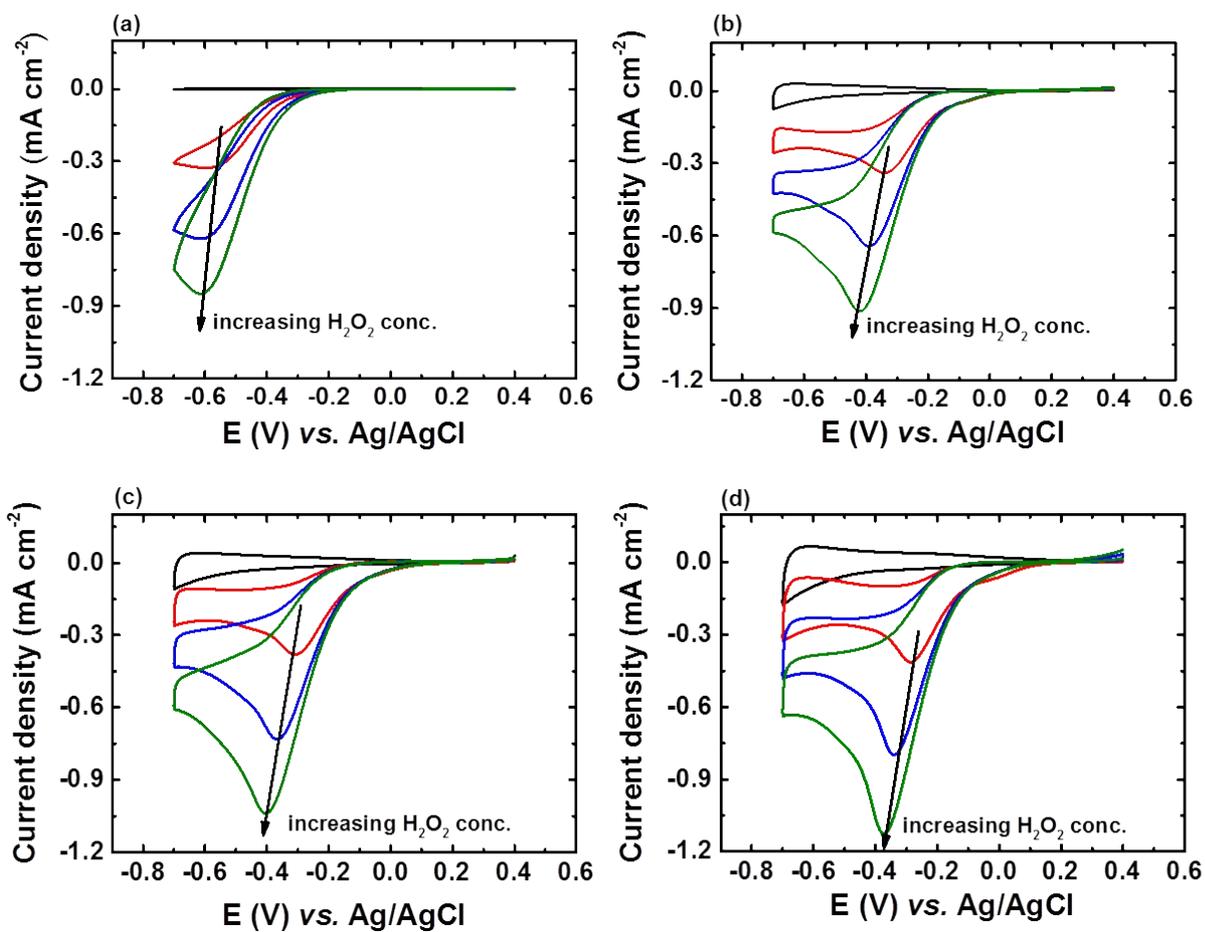


Figure S5 Cyclic voltammetry, recorded at a scan rate of 20 mV s⁻¹, of (a) FTO, (b) α -Fe₂O₃NR, (c) α -Fe₂O₃NS, and (d) α -Fe₂O₃NP in 0.1 M Na₂SO₄ solution (pH 7) containing H₂O₂ of various concentrations (0, 1.66, 3.31, and 4.95 mM).

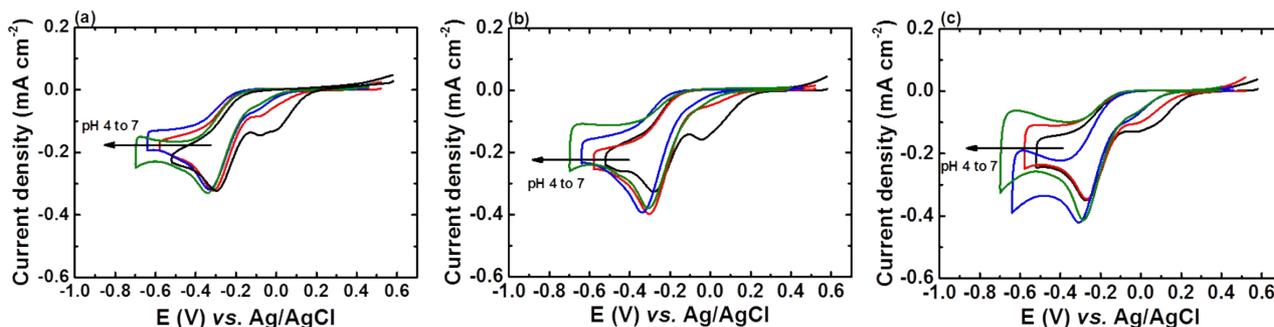


Figure S6 CVs, recorded at a scan rate of 20 mV s^{-1} , of (a) $\alpha\text{-Fe}_2\text{O}_3\text{NR}$, (b) $\alpha\text{-Fe}_2\text{O}_3\text{NS}$, and (c) $\alpha\text{-Fe}_2\text{O}_3\text{NP}$ in $0.1 \text{ M Na}_2\text{SO}_4$ electrolyte containing $1.66 \text{ mM H}_2\text{O}_2$ at various pHs ranging from 4 to 7.

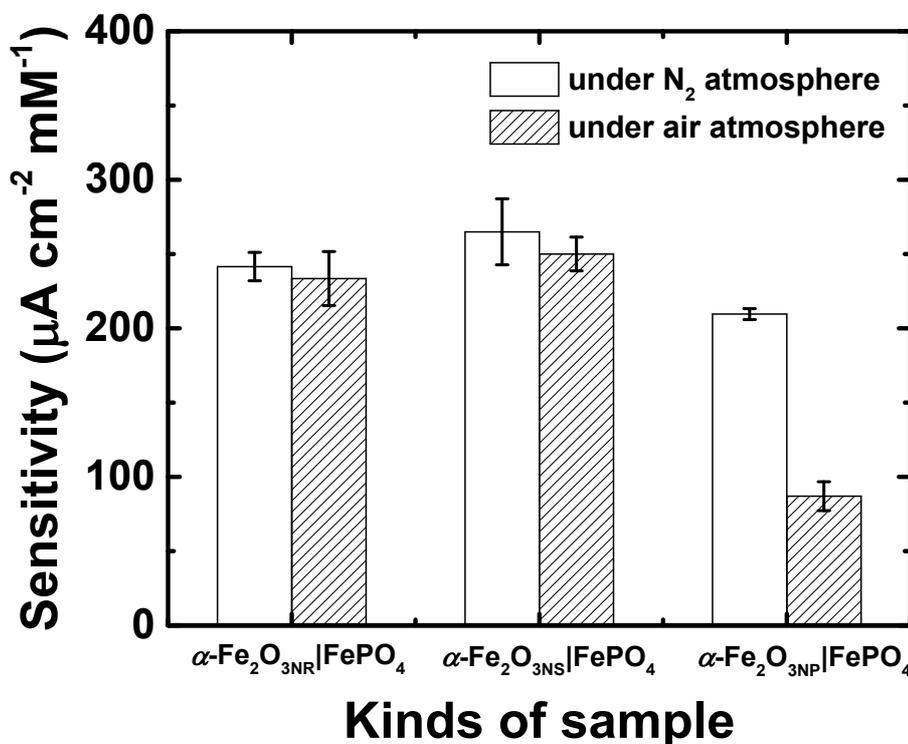


Figure S7 Sensitivities of $\alpha\text{-Fe}_2\text{O}_3\text{NR}|\text{FePO}_4$, $\alpha\text{-Fe}_2\text{O}_3\text{NS}|\text{FePO}_4$, and $\alpha\text{-Fe}_2\text{O}_3\text{NP}|\text{FePO}_4$ towards the electrochemical reduction of H_2O_2 in 0.1 M PBS (pH 6) under N_2 and air atmospheres. The sensitivity was obtained from Figure 7.