Loading FeOOH on Ni(OH)$_2$ hollow nanorods to obtain a three-dimensional sandwich catalyst with strong electron interactions for efficient oxygen-evolution reaction

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Figure S1. XRD pattern of ZnO.
Figure S2. XRD patterns of NF, Ni(OH)$_2$ HNRAs/NF, FeOOH/NF and FeOOH@Ni(OH)$_2$ SHNRAs/NF.

Figure S3. XRD pattern of FeOOH@Ni(OH)$_2$ SHNRAs/NF by slow scanning for 1 h.
Figure S4. (a) SAED pattern of Ni(OH)$_2$ HNRAs/NF, (b) High-resolution TEM image of Ni(OH)$_2$ HNRAs/NF.

Figure S5. EDS profile of FeOOH@Ni(OH)$_2$ SHNRAs/NF.
Figure S6. EDS profile of Ni(OH)$_2$ HNRAs/NF.

Figure S7. Effect of ZnO template on electrochemical performance of Ni(OH)$_2$ catalyst.
Figure S8. Raman spectra of Ni(OH)$_2$ HNRAs/NF and FeOOH@Ni(OH)$_2$ SHNRAs/NF.

Figure S9. Effect of Ni concentration on the morphology of Ni(OH)$_2$ HNRAs/NF:
SEM images of (a) 0.01M, (b) 0.02M, (c) 0.03M.
Figure S10. Effect of Ni deposition time on the morphology of Ni(OH)$_2$ HNRAs/NF: SEM images of (a) 300s, (b) 600s, (c) 1200s, (d) 2400s.

Figure S11. Effect of Ni deposition temperature on the morphology of Ni(OH)$_2$ HNRAs/NF: SEM images of (a) 20°C, (b) 25°C, (c) 30°C.

Figure S12. SEM image of (a) FeOOH@Ni(OH)$_2$ (Proper) SHNRAs/NF, (b) FeOOH@Ni(OH)$_2$ (Thin) SHNRAs/NF, (c) Polarization curves (iR-compensated) of them.
Figure S13. Effect of Fe concentration on electrochemical performance of FeOOH@Ni(OH)$_2$ SHNRAs/NF: (a) Polarization curves (iR-compensated), (b) Tafel slopes.

Figure S14. Effect of Fe deposition voltage on electrochemical performance of FeOOH@Ni(OH)$_2$ SHNRAs/NF: (a) Polarization curves (iR-compensated), (b) Tafel slopes.

Figure S15. Effect of Fe deposition time on electrochemical performance of FeOOH@Ni(OH)$_2$ SHNRAs/NF: (a) Polarization curves (iR-compensated), (b) Tafel slopes.
Figure S16. XPS spectra of Ni 2p region for Ni(OH)$_2$ HNRAs/NF before and after electrochemical deposition process.

Figure S17. CV curves in a potential range of 0.31–0.37 V versus RHE of (a) FeOOH@Ni(OH)$_2$ SHNRAs/NF, and (b) FeOOH@Ni(OH)$_2$/NF in 1.0 M KOH.
Figure S18. Nitrogen adsorption-desorption isotherms of FeOOH@Ni(OH)$_2$ SHNRAs and FeOOH@Ni(OH)$_2$ catalysts.
Figure S19. XPS spectra of (a) Ni 2p, (b) Fe 2p and (c) O 1s region for FeOOH@Ni(OH)$_2$ SHNRA/NF before and after OER testing.
Figure S20. Experimental vs. theoretical amount of O$_2$ produced using the FeOOH@Ni(OH)$_2$ SHNRAs/NF electrode at a fixed current of 50 mA.

Table S1. Comparison of catalytic performance with other similar catalysts that have been reported ($\eta@j$: Overpotential at the applied current density)

<table>
<thead>
<tr>
<th>Catalyst</th>
<th>Electrode substrate</th>
<th>$\eta$/mV@j/mA cm$^2$</th>
<th>Tafel slope /mV dec$^{-1}$</th>
<th>Electrolyte</th>
<th>Reference</th>
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<tr>
<td>FeOOH@Ni(OH)$_2$ SHNRAs</td>
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<td>45</td>
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<td>This work</td>
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<td>NiCoFe$_x$P</td>
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<td>FeOOH/NiFe LDH</td>
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<td>-</td>
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References