Electronic Supporting Information (ESI)

The Performance of $\alpha$-Fe$_2$O$_3$ Photoanode-based Photofuel Cell Enhanced by Transition Metals (Ni, Fe, and Cu) Hydroxides

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**Fig. S1** (a) SEM image of Ni(OH)$_2$/Fe$_2$O$_3$ on a FTO glass substrate. (b) EDS spectrum collected for the Ni(OH)$_2$ modified hematite film. Elemental mapping of (c) Fe and (d) Ni.
**Fig. S2** EDS linescan profile of Fe (green line) and Ni (red line) acquired across the Fe₂O₃ nanorod. Position and the scan direction are depicted by the red arrow in the dark-field STEM image.

**Fig. S3** LSV curves collected for Ni(OH)₂/Fe₂O₃ photoanode at a scan rate of 50 mV s⁻¹ in a 1 M KOH aqueous solution with glucose (solid line) and without glucose (dashed line).
Fig. S4 LSV curves of α-Fe₂O₃ and Ni(OH)$_2$/α-Fe₂O₃ photoanodes in a 1 mol L$^{-1}$ KOH solution; Light source: 300 W Xe lamp; Scanning rate: 20 mV s$^{-1}$. 
The XPS (X-ray Photoelectron Spectroscopy) results of Ni(OH)$_2$/α-Fe$_2$O$_3$ electrode show weak peaks of Fe 2p$_{3/2}$ (710.8 eV) and 2p$_{1/2}$ (724.6 eV) (Fig. S3A, ESI†), which are in good agreement with documented values of Fe$^{3+}$ species. Fig. S3B shows that a binding energy of 856.0 eV and 873.6 eV with intense satellite signals are assigned to Ni 2p$_{3/2}$ and 2p$_{1/2}$ in Ni(OH)$_2$, respectively.
Table S1 The intermediates from glucose in the I-t test with Ni(OH)$_2$/α-Fe$_2$O$_3$ photoanode.

<table>
<thead>
<tr>
<th>Consumed of Glucose (mmol L$^{-1}$)</th>
<th>The products (mmol L$^{-1}$)</th>
<th>C-balance (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Arabinose (C5)</td>
<td>18.9</td>
</tr>
<tr>
<td></td>
<td>Erythrose (C4)</td>
<td>6.07</td>
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<tr>
<td></td>
<td>Glyceraldehyde (C3)</td>
<td>0.61</td>
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<tr>
<td></td>
<td>Glycolaldehyde (C2)</td>
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<tr>
<td></td>
<td>Glycolalic acid (C2)</td>
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<td></td>
<td>Formic acid (C1)</td>
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<td>15.4</td>
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<tr>
<td></td>
<td></td>
<td>71.1</td>
</tr>
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</table>

Reaction condition: Ni(OH)$_2$/α-Fe$_2$O$_3$ photoanode at 0 V vs. SCE in a 1 mol L$^{-1}$ KOH aqueous solution with 0.025 mol L$^{-1}$ glucose. Light source: 300 W Xe lamp. Reaction time, 6 h. The area of Fe$_2$O$_3$ film is 1.58 cm$^2$.

Fig. S6 The molecular structures of the intermediates from glucose.