Supplementary Information

Coupling of PET Waste Electroreforming with Green Hydrogen Generation using Bifunctional Catalyst

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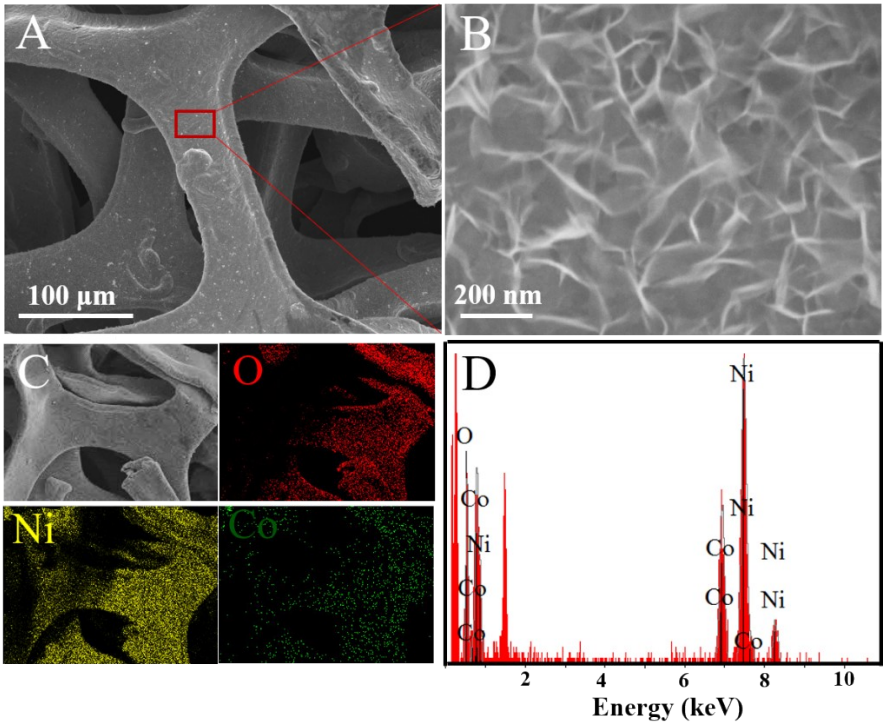

Figure S1. Morphological and composition characterizations of Co-Ni$(OH)_2$/NF. (A) and (B) SEM images, (C) SEM-mapping, and (D) SEM-EDX.

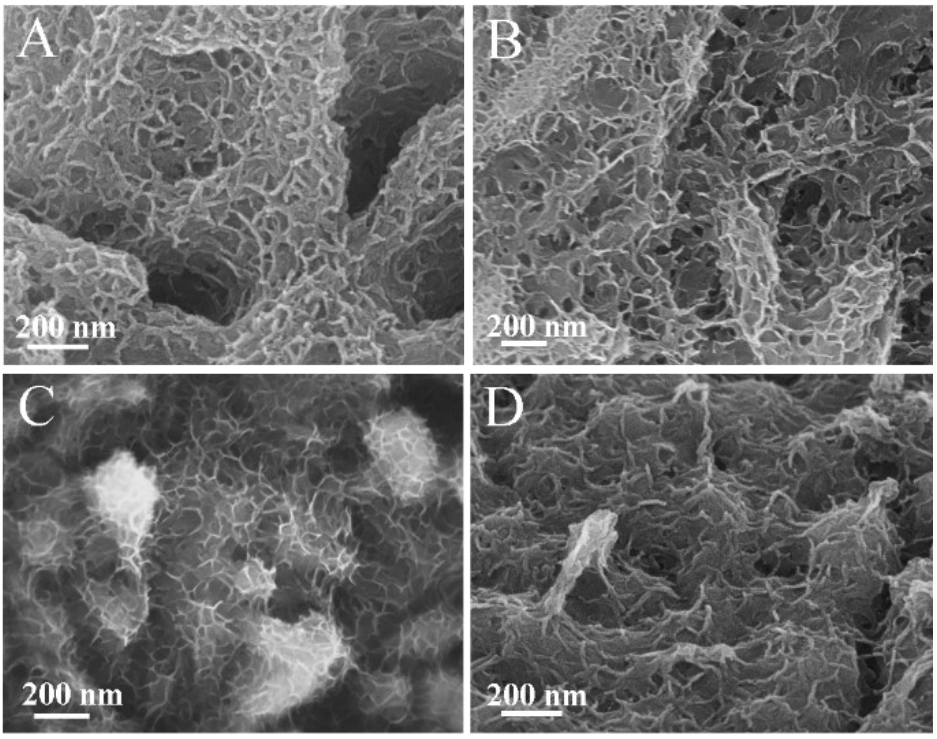

Figure S2. Morphological of four Co-Ni_2P/NF sample. SEM images of (A) $Co_{0.2}$-Ni_2P/NF, (B) $Co_{0.4}$-Ni_2P/NF, (C) $Co_{0.6}$-Ni_2P/NF and (D) $Co_{0.8}$-Ni_2P/NF.

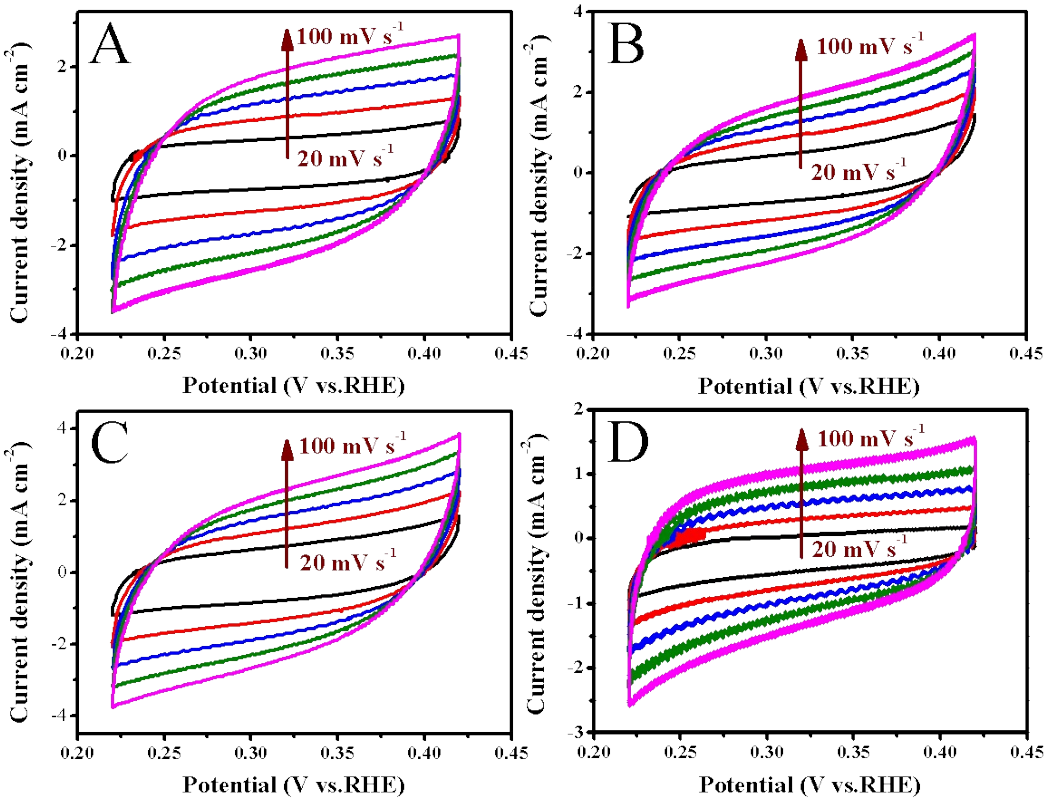

Figure S3. CV curves of (A) $Co_{0.6}$-Ni_2P/NF, (B) Ni_2P/NF, (C) CoP/NF, and (D) Co-$Ni(OH)_2$/NF in 1 M NaOH electrolyte at different scan rates.

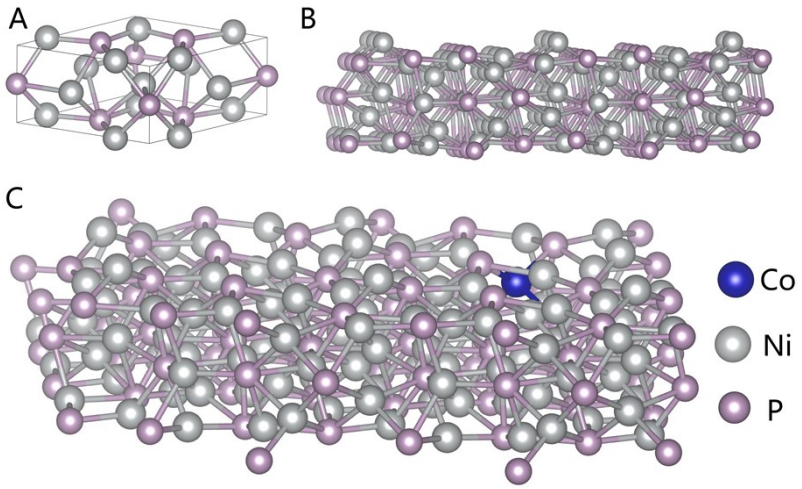

Figure S4. The atomic models of Ni_2P unitcell. (A) pristine surface (B) and Co doped surface.

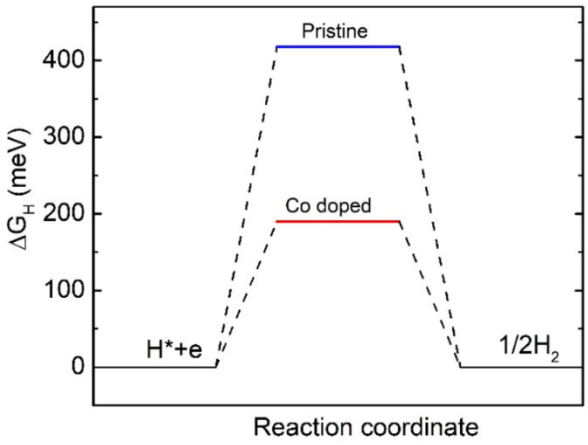

Figure S5. The calculated Gibbs free energies of H on the pristine and Co doped Ni_2P surfaces.

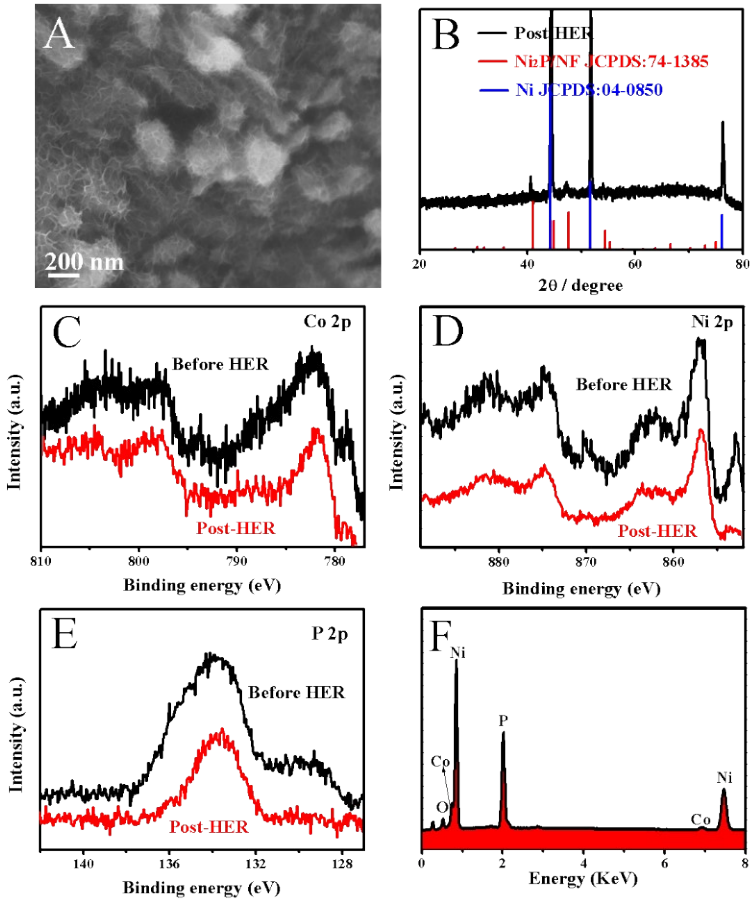

Figure S6. The morphology characterization and composition analyses of $Co_{0.6}$-Ni_2P/NF after HER reaction. (A) the SEM image, (B) XRD pattern, high-resolution XPS spectra of (C) Co 2p, (D) Ni 2p, (E) P 2p peaks of the Co-Ni_2P/NF and (F) SEM-EDS spectral of the Co-Ni_2P/NF.

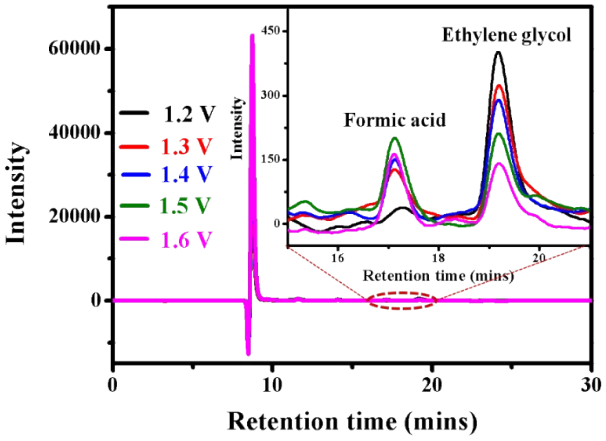

Figure S7. The HPLC analysis of the products of PET hydrolysate electrooxidation.

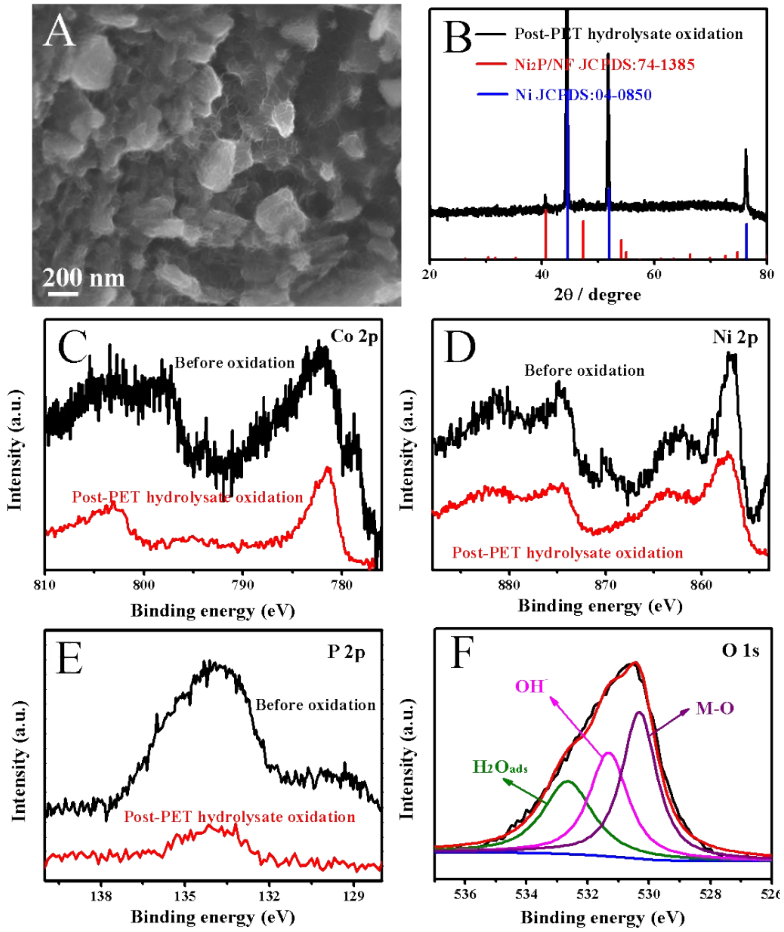

Figure S8. The morphology characterization and composition analyses of Co-Ni_2P/NF post-PET hydrolysate electrooxidation. (A) the SEM image, (B) XRD pattern, high-resolution XPS spectra of (C) Co 2p, (D) Ni 2p, (E) P 2p and (F) O 1s peaks of the Co-Ni_2P/NF.

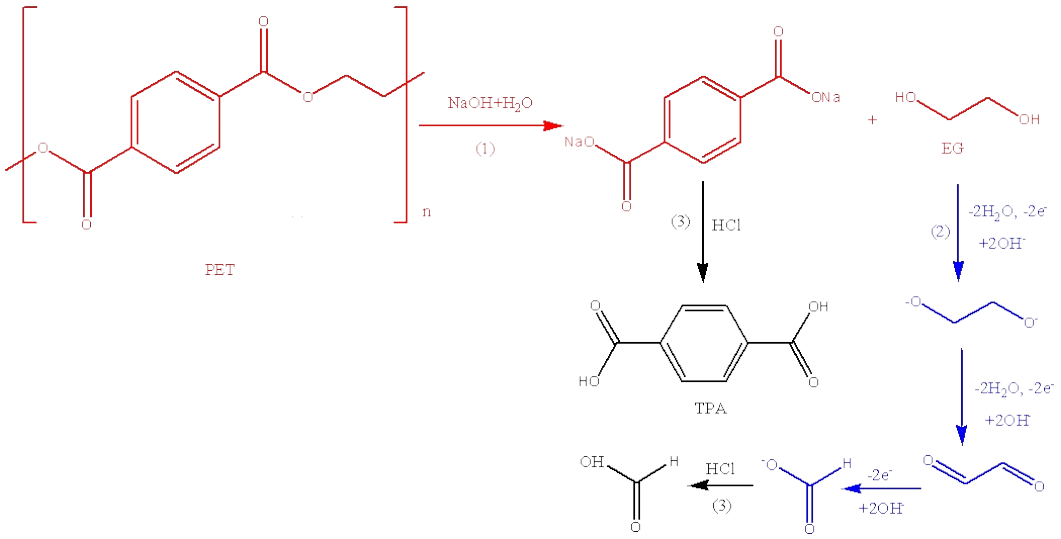

Figure S9. The process for waste PET bottle upcycling.

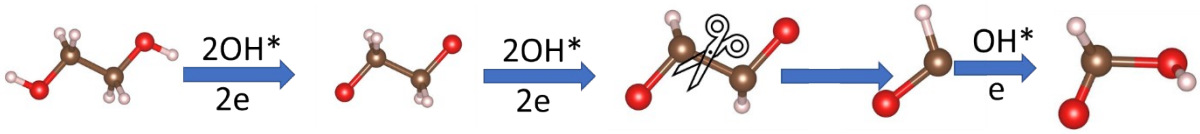

Figure S10. The sketch of the electrooxidation process of the ethylene glycol (EG). The final product is formic acid (HCOOH).

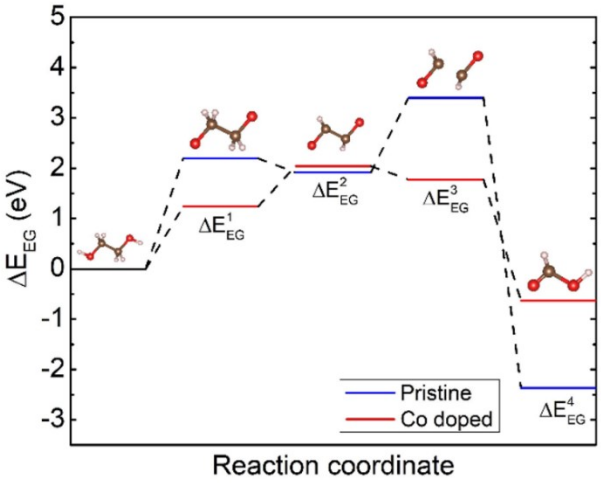

Figure S11. The calculated energy landscape of the EG electrooxidation reaction process on the pristine and Co doped Ni_2P surfaces.