Supplementary information

Charge Redistribution Induced by Well-Dispersed Cobalt Oxide Nanoparticles on $Co_3(PO_4)_2$ Surface Enhances OER Catalytic Activity

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1. Comparaision of XRD difractogramms of amorphous $Co_3(PO_4)_2$, amorphous $Co_3(PO_4)_2$@Co_3O_4, and TGA analysis of $Co_3(PO_4)_2.8H_2O$:

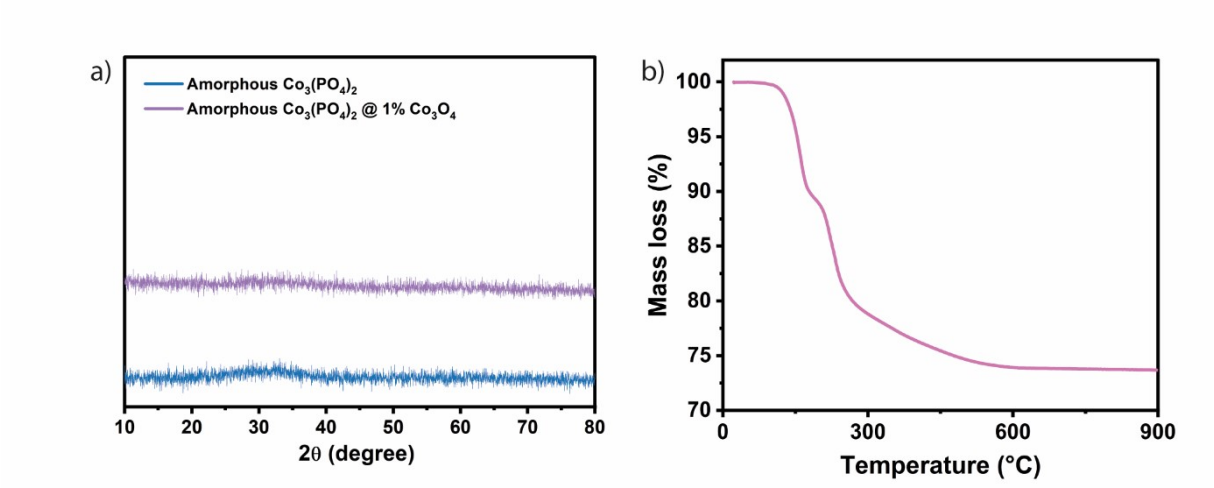


Figure S1: (a) XRD difractogramms of amorphous $Co_3(PO_4)_2$, amorphous $Co_3(PO_4)_2$@Co_3O_4. (b) TGA analysis of $Co_3(PO_4)_2.8H_2O$.

2. Survey spectra of $Co_3(PO_4)_2.8H_2O$:

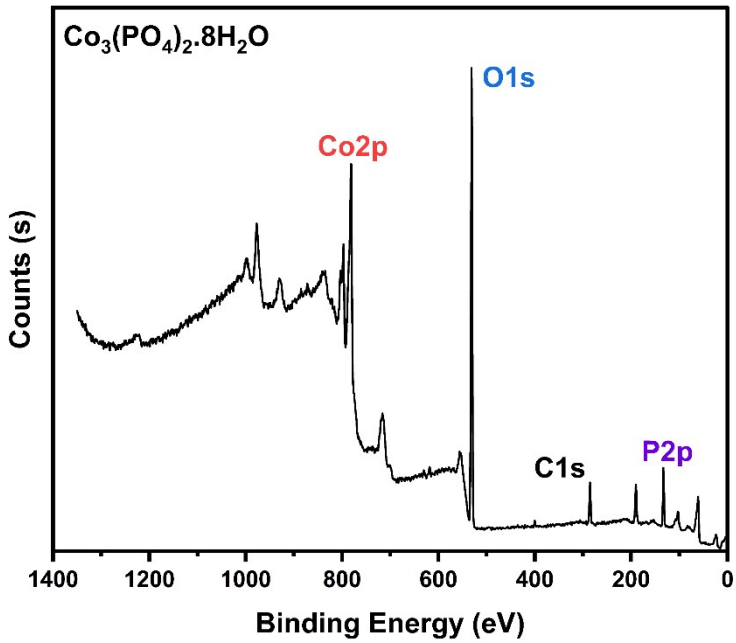
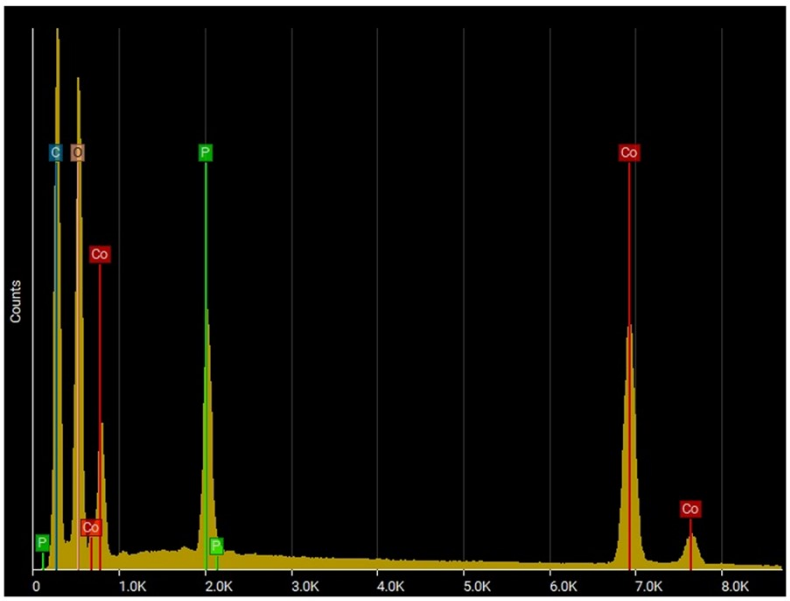


Figure S2: Survey spectra of Co3(PO4)2.8H2O

3. Energy-dispersive X-ray curve of amorphous $Co_3(PO_4)_2$:



Element	Atomic %	Weight %
Cobalt	13.84	36.04
Oxygen	81.54	57.63
Phosphorus	4.62	6.32

Figure S3: energy-dispersive X-ray curve with the atomic ratio (%) of Co, P and O in the amorphous $Co_3(PO_4)_2$.

4. Electrochemical characterization of amorphous $Co_3(PO_4)_2$ and crystalline $Co_3(PO_4)_2.8H_2O$:

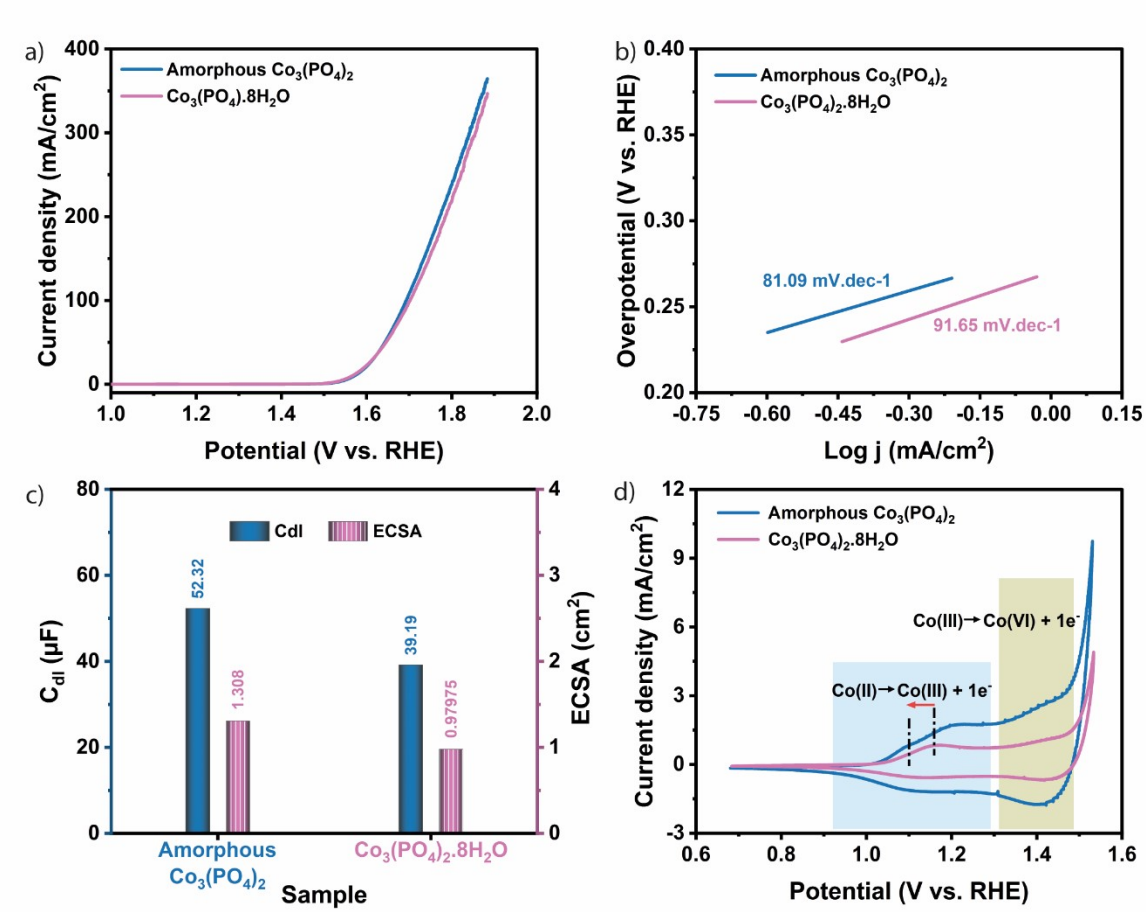


Figure S4: Electrochemical characterization of amorphous $Co_3(PO_4)_2$ and crystalline $Co_3(PO_4)_2.8H_2O$: (a) LSV. (b) Tafel slope. (c) Double layer capacitance and electrochemical surface area, and (d) cyclic voltammetry.

5. Electrochemical characterization for amorphous $Co_3(PO_4)_2$ decorated with 5, 10% and 20% with Co_3O_4:

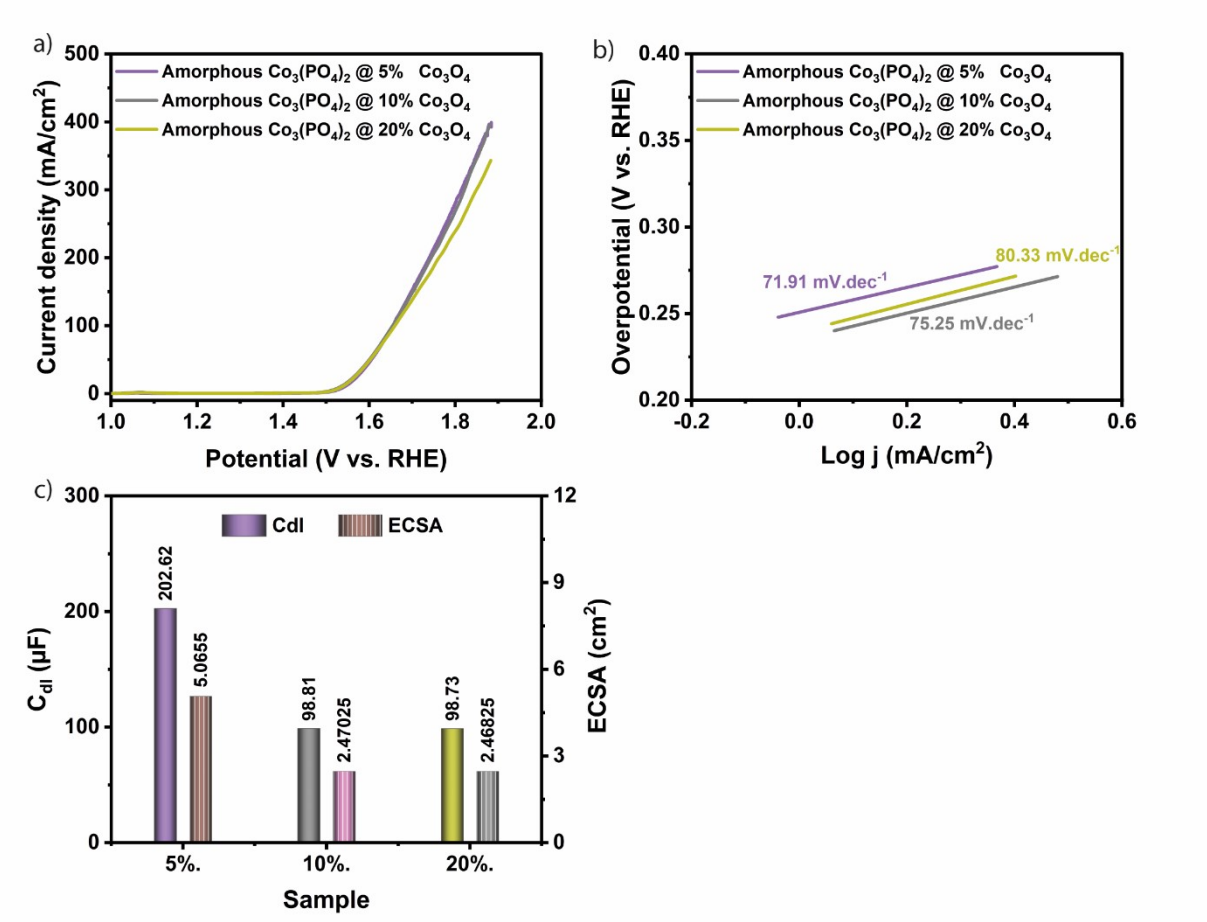


Figure S5: Electrochemical characterization for amorphous $Co_3(PO_4)_2$ decorated with 5, 10% and 20% with Co_3O_4: (a) LSV of amorphous $Co_3(PO_4)_2$ and crystalline $Co_3(PO_4)_2.8H_2O$. (b) Tafel slope. (c) Double layer capacitance and electrochemical surface area.

6. Electrochemical impedance spectroscopy of the prepard catalysts:

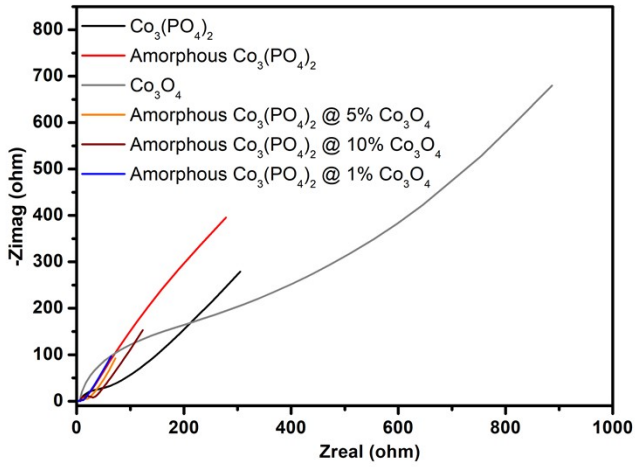


Figure S6: Electrochemical Impedance Spectroscopy (EIS) of different catalysts in 1m KOH over a frequency range of 100 kHz to 10 mHz with an applied AC amplitude of 10 mV

7. DFT density of state details of isolated and $Co_3(PO_4)_2$ surface adsorbed Co_3O_4 nanoparticle over Co p orbitals.

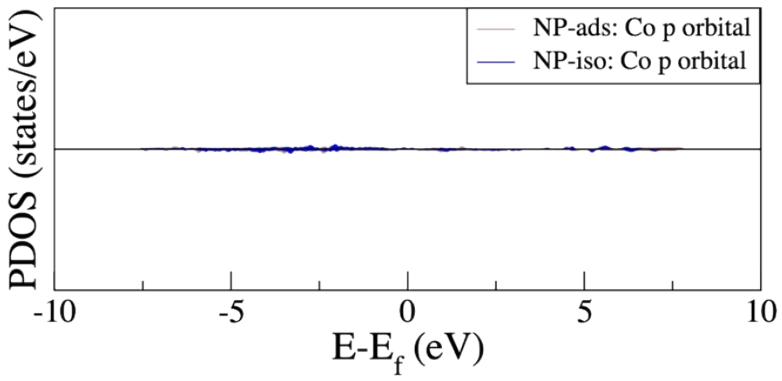


Figure S7: Partial density of states of isolated and Co3(PO4)2 surface adsorbed Co3O4 nanoparticle over Co p orbitals

8. DFT density of Partial density of states of Co_3O_4 nanoparticle in isolated and 2 nanoparticles configurations over Co p orbitals.

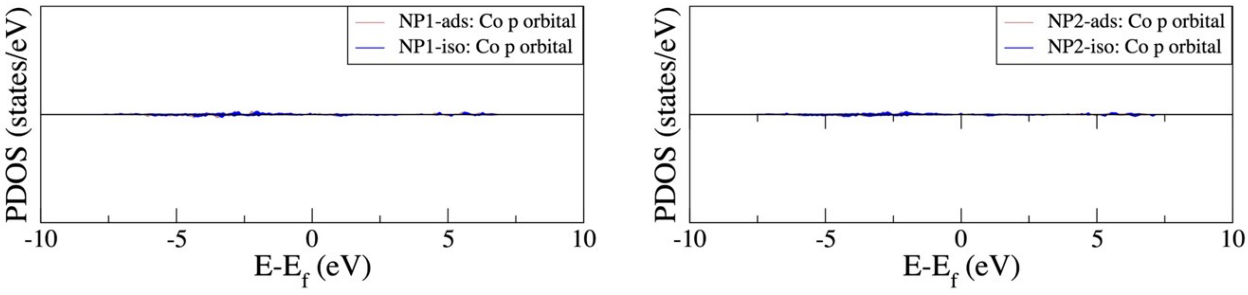


Figure S8: Partial density of states of Co3O4 nanoparticle in isolated and 2 nanoparticles configurations over Co p orbitals