Supporting Information

Cold Plasma Synthesis of Phosphorus-doped $CoFe_2O_4$ with Oxygen Vacancies for Enhanced OER Activity

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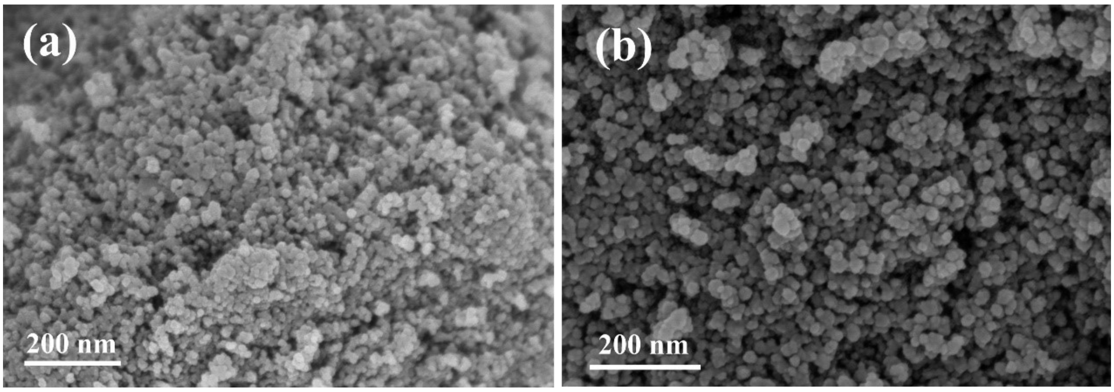

Fig. S1 SEM images of samples (a) $CoFe_2O_4$, (b) $CoFe_2O_4$-V_O

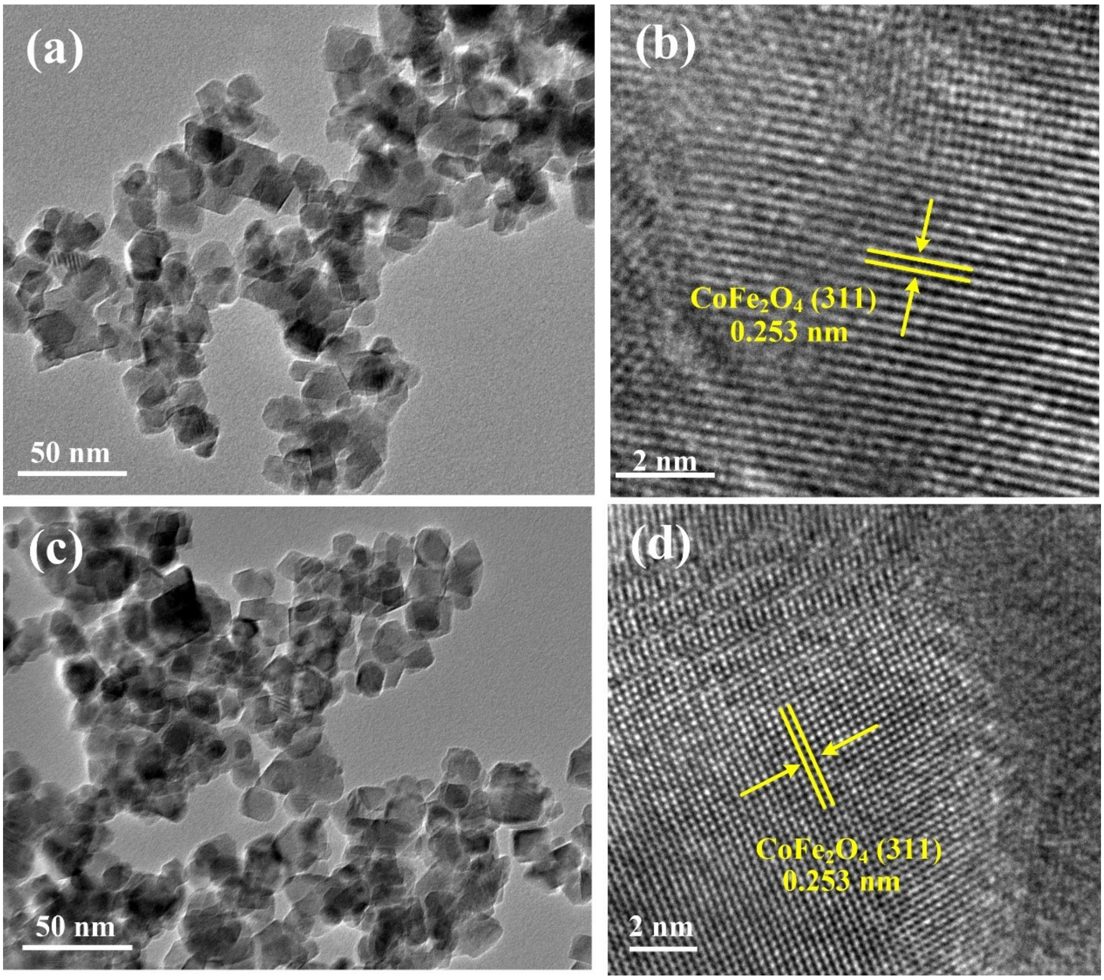

Fig. S2 TEM and SEM images of the samples. (a, b)$CoFe_2O_4$, (c, d)$CoFe_2O_4$-V_O.

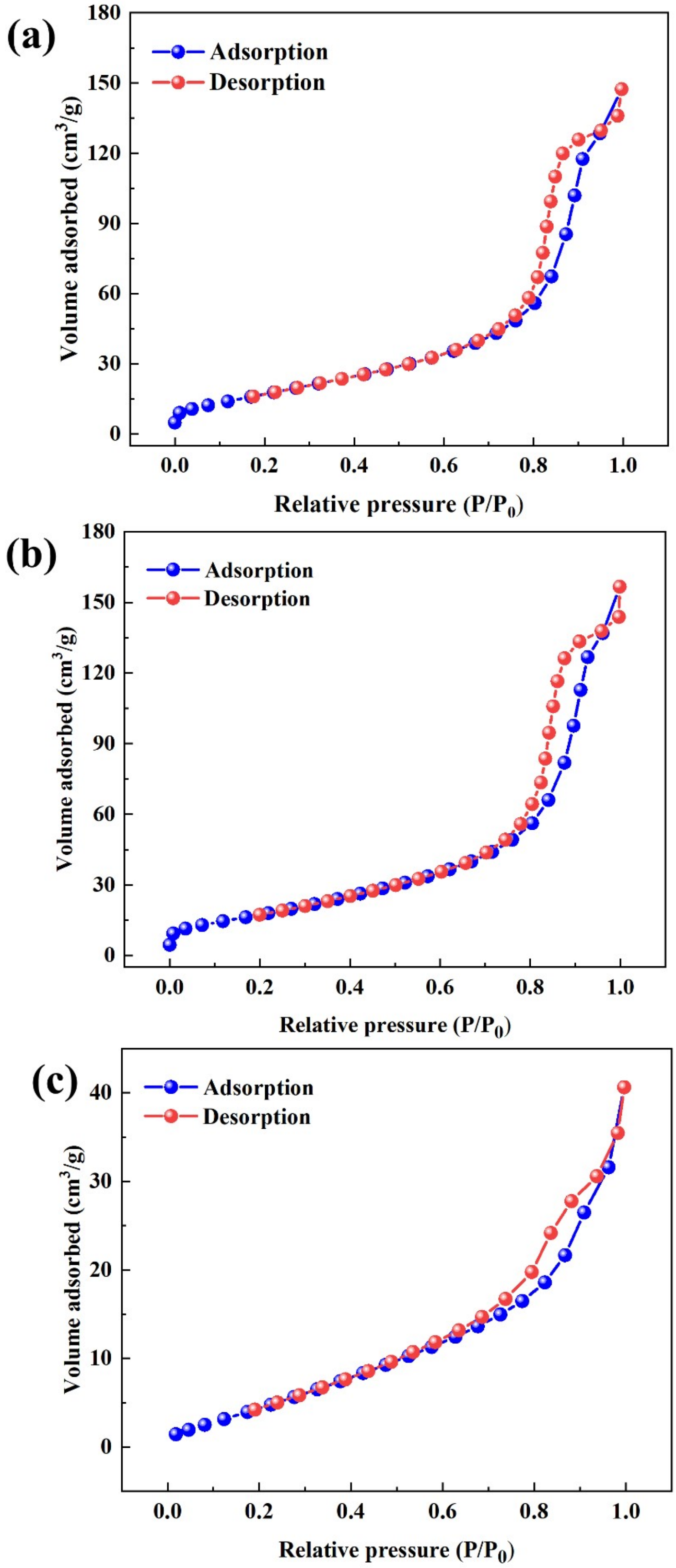

Fig. S3 N_2-adsorption/desorption isotherms of (a) $CoFe_2O_4$, (b) $CoFe_2O_4$-V_O and (c) $CoFe_2O_4$-P.

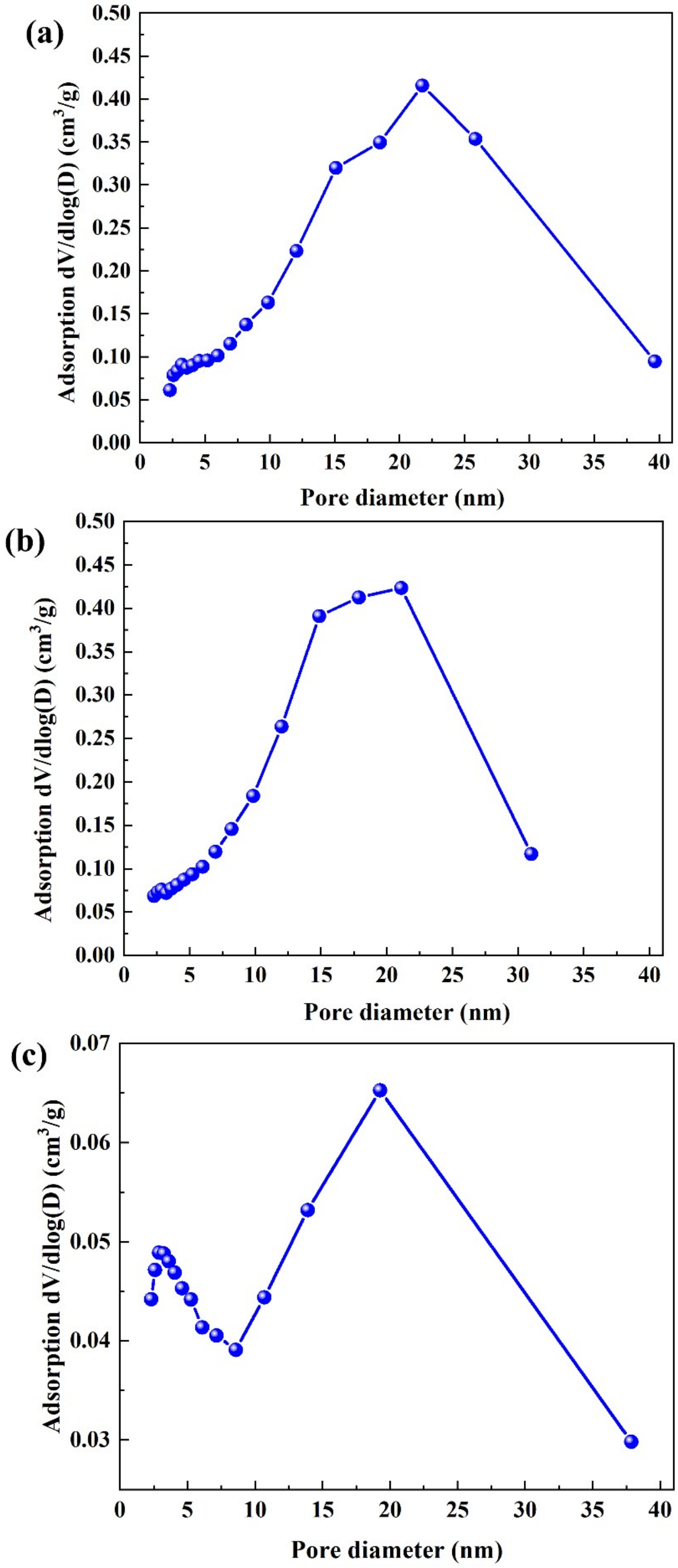

Fig. S4 Pore size distributions of (a) $CoFe_2O_4$, (b) $CoFe_2O_4$-V_O and (c) $CoFe_2O_4$-P.

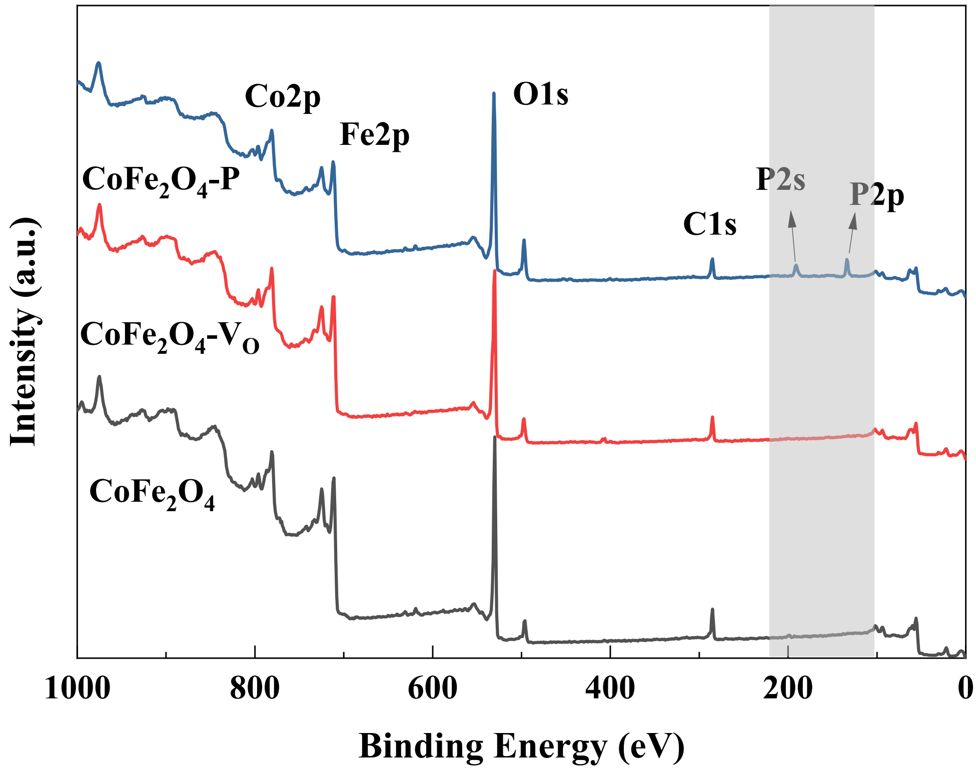

Fig. S5 XPS spectra of samples

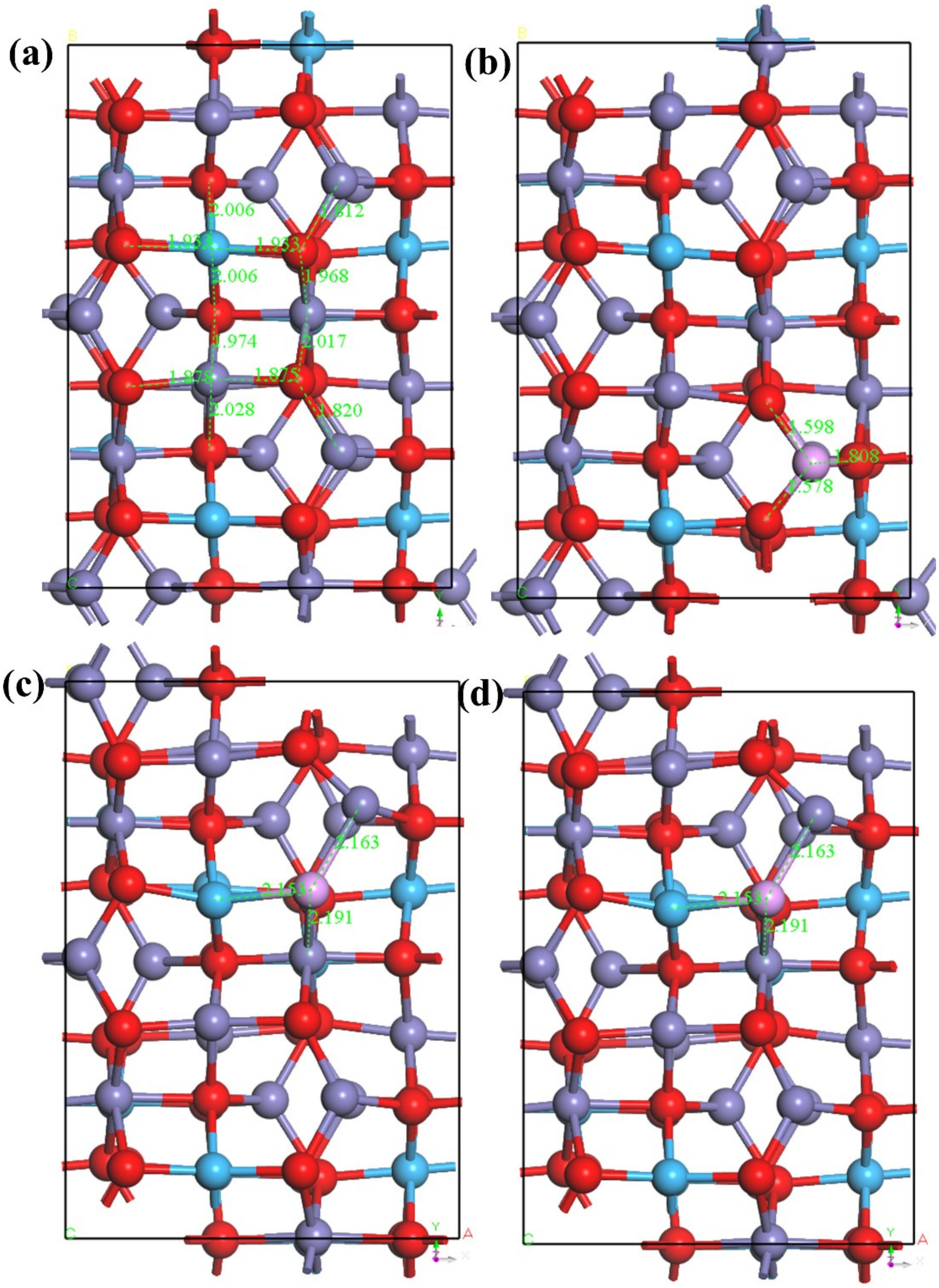

Fig. S6 Top view and bond length of $CoFe_2O_4$-P. (a) undoped, (b) Fe(Td), (c) O1 and (d) O2

Table S1. Doping energy of phosphorus at different sites

site	Co(Oh)	Fe(Oh)	Fe(Td)	O1	O2
Doping energy (eV)	-0.621	-0.592	0.281	5.295	4.321

Table S2 Summary of reported OER Activity for the recent catalysts.

Catalyst	η at 10 mA cm^{-2} (mV)	Tafel slope (mV dec^{-1})	Electrolyte	Ref
$CoFe_2O_4$-P	180	65.8	1.0 M KOH	This work
$CaCo_2O_4$	371	71	0.1 M KOH	1
$CoFe_2O_4$	410	64	1 M NaOH	2
$NiFe_2O_4$	450	80	1.0 M NaOH	2
$MnCo_2O_4$	400	90	0.1 M KOH	3
$MnCo_2O_4$	>500	103.7	0.1 M KOH	4
$MgCo_2O_4$	283	66	1.0 M KOH	5
$MnCo_2O_4$ /CeO_2	276	87	1.0 M KOH	6
$Fe_{0.2}Ni_{0.8}Co_2O_4$	270	39	1.0 M KOH	7
NiS/$NiFe_2O_4$	230	88	1.0 M KOH	8
$NiCo_2$-xFe_xO_4	274	42	1.0 M KOH	9
MoS_2/rFe-$NiCo_2O_4$	270	39	1.0 M NaOH	10
$MnFe_2O_4$/NF	310	65	1.0 M KOH	11
CFO-B-MS	208	63	1.0 M KOH	12

Table S3 The ICP results of $CoFe_2O_4$-P.

Catalyst	Co/wt%	Fe/wt%	O/wt%	P/wt%
$CoFe_2O_4$-P	39.47	19.02	18.25	23.27

References

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