Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information

Tungsten doped $FeCoP_2$ nanoparticles Embedded into Carbon for Highly Efficient Oxygen Evolution Reaction

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Number of tables: 5 (Table S1-S5)

Number of figures: 8 (Figure S1-S8)

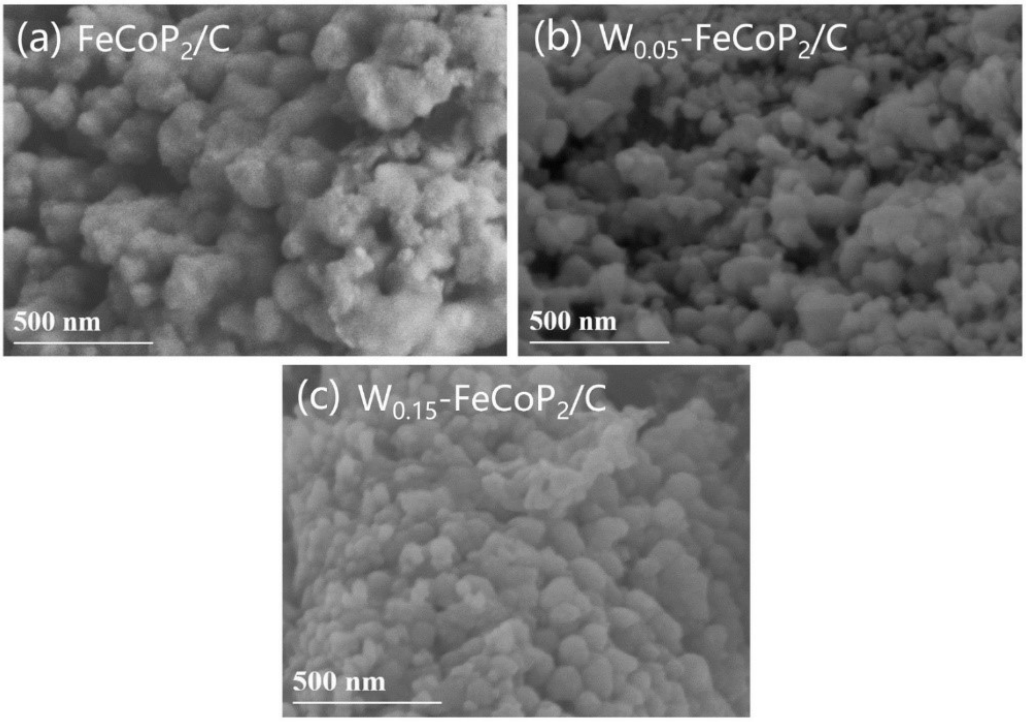

Figure S1. FESEM images of (a) $FeCoP_2/C$, (b) $W_{0.05}$-$FeCoP_2/C$ and (c) $W_{0.15}$-$FeCoP_2/C$

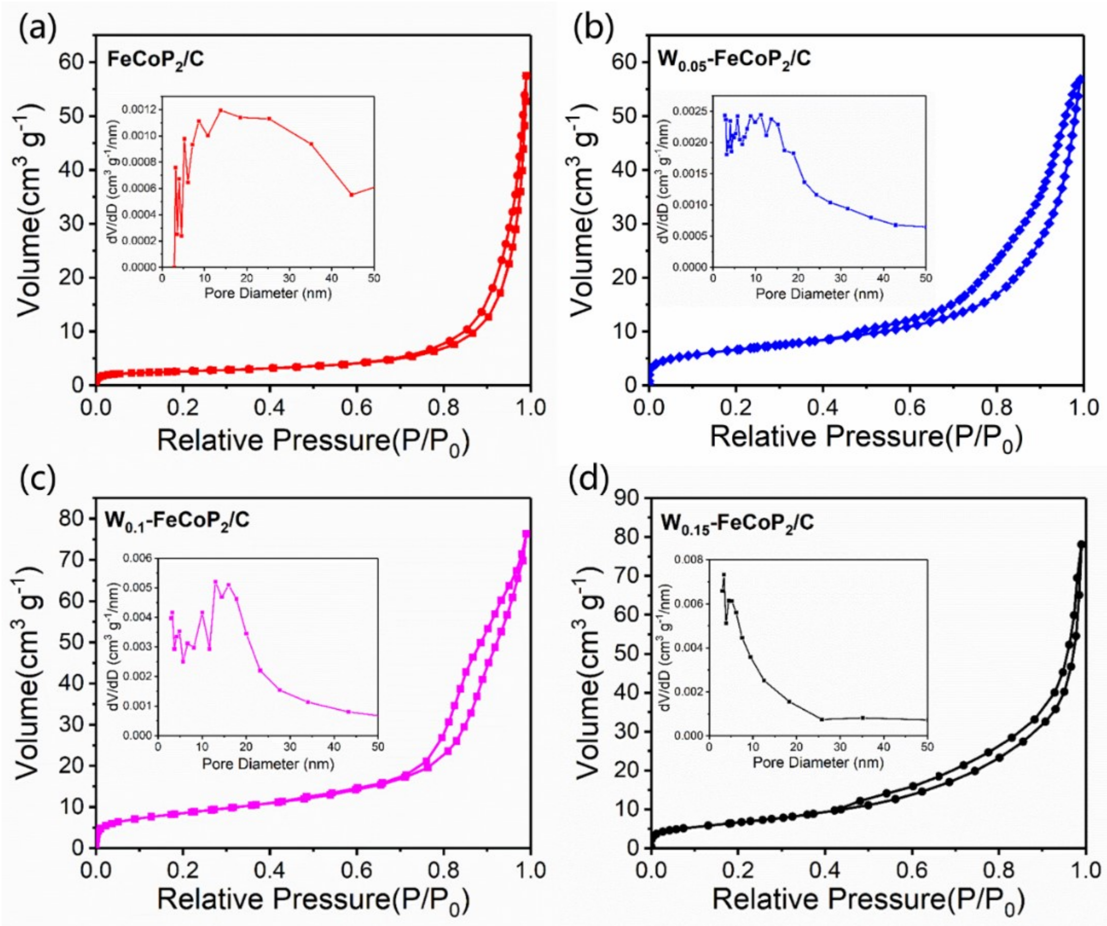

Figure S2. N_2 adsorption-desorption isotherms of (a) $FeCoP_2/C$, (b) $W_{0.05}$-$FeCoP_2/C$, (c) $W_{0.1}$-$FeCoP_2/C$, and (d) $W_{0.15}$-$FeCoP_2/C$

Table S1. The surface areas and pore volume of $FeCoP_2/C$, $W_{0.05}$-$FeCoP_2/C$, $W_{0.1}$-$FeCoP_2/C$ and $W_{0.15}$-$FeCoP_2/C$

Samples	**Surface area (m^2 g^{-1})**	**Micropore volume (cm^3 g^{-1})**	**Mesopore volume (cm^3 g^{-1})**
$FeCoP_2/C$	22.81	0.0095	0.074
$W_{0.05}$-$FeCoP_2/C$	28.22	0.0104	0.087
$W_{0.1}$-$FeCoP_2/C$	36.94	0.0124	0.121
$W_{0.15}$-$FeCoP_2/C$	30.67	0.0108	0.115

Table S2. The normalized atomic ratios of Fe, Co and W elements in W_x-$FeCoP_2$/C measured by ICP-OES

Samples	**Fe (Atomic)**	**Co (Atomic)**	**W (Atomic)**	**Fe: Co: W (Atomic)**
$W_{0.05}$-$FeCoP_2$/C	4.22	4.32	0.19	1.11:1.14:0.05
$W_{0.1}$-$FeCoP_2$/C	3.87	3.90	0.36	1.08:1.09:0.1
$W_{0.15}$-$FeCoP_2$/C	4.11	3.89	0.51	1.21:1.14:0.15

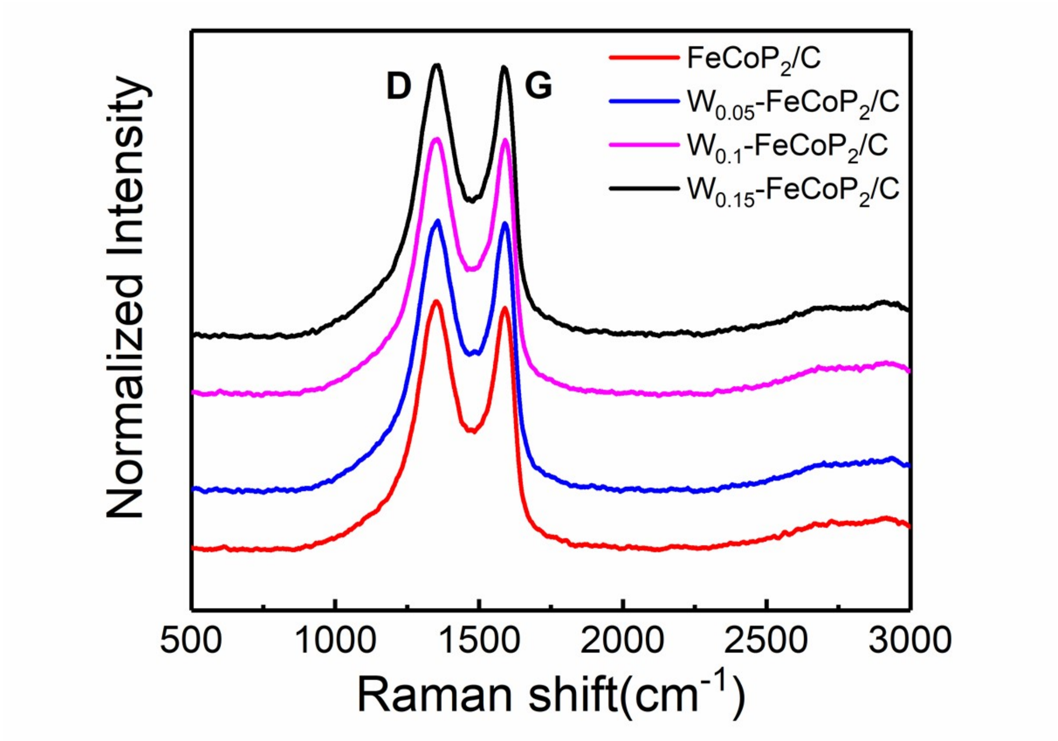

Figure S3. Raman spectra of $FeCoP_2/C$， $W_{0.05}$-$FeCoP_2/C$, $W_{0.1}$-$FeCoP_2/C$ and $W_{0.15}$-$FeCoP_2/C$

Table S3. The ratios of I_D/I_G in different samples measured by Raman spectra

Samples	**I_D/I_G**
$FeCoP_2/C$	1.018
$W_{0.05}$-$FeCoP_2/C$	1.010
$W_{0.1}$-$FeCoP_2/C$	1.002
$W_{0.15}$-$FeCoP_2/C$	1.008

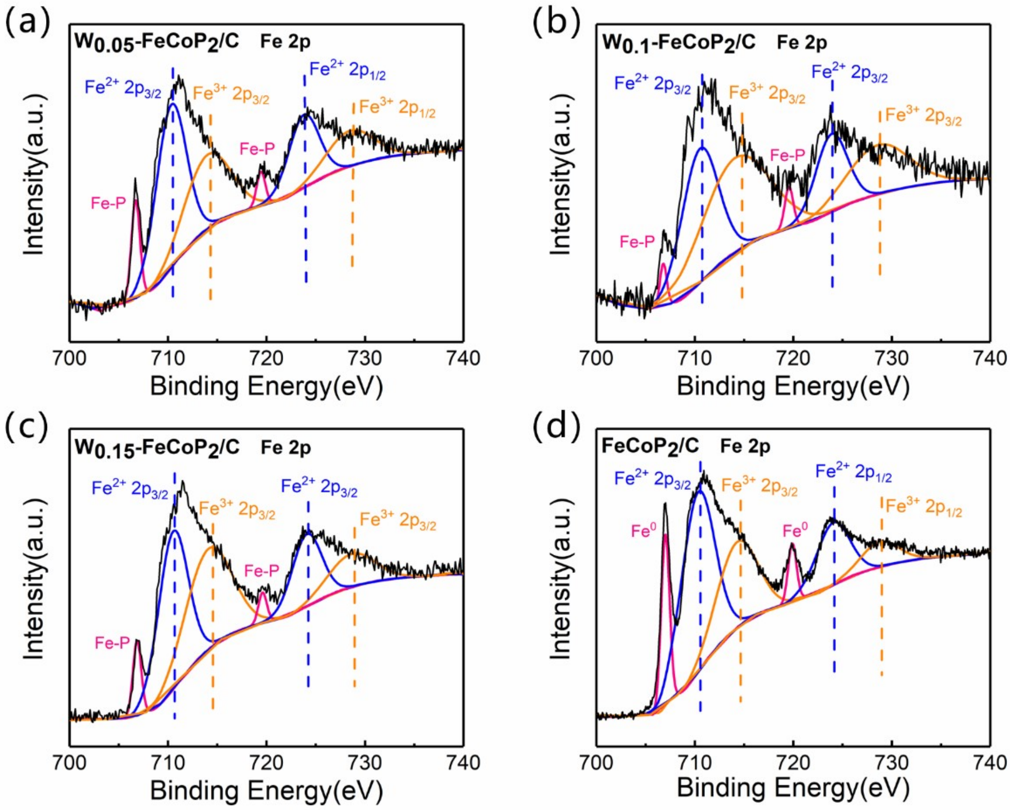

Figure S4. Fe 2p XPS spectra of $FeCoP_2/C$，$W_{0.05}$-$FeCoP_2/C$, $W_{0.1}$-$FeCoP_2/C$ and $W_{0.15}$-$FeCoP_2/C$

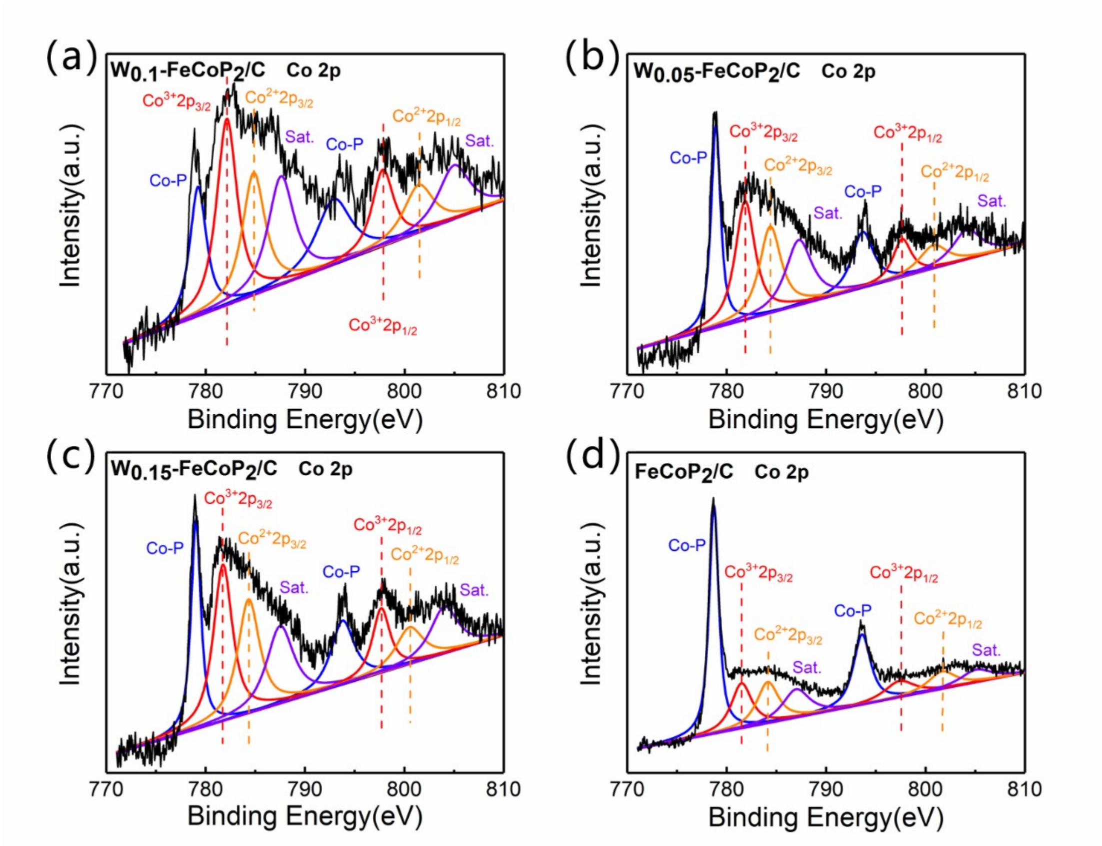

Figure S5. Co 2p XPS spectra of $FeCoP_2/C$，$W_{0.05}$-$FeCoP_2/C$, $W_{0.1}$-$FeCoP_2/C$ and $W_{0.15}$-$FeCoP_2/C$

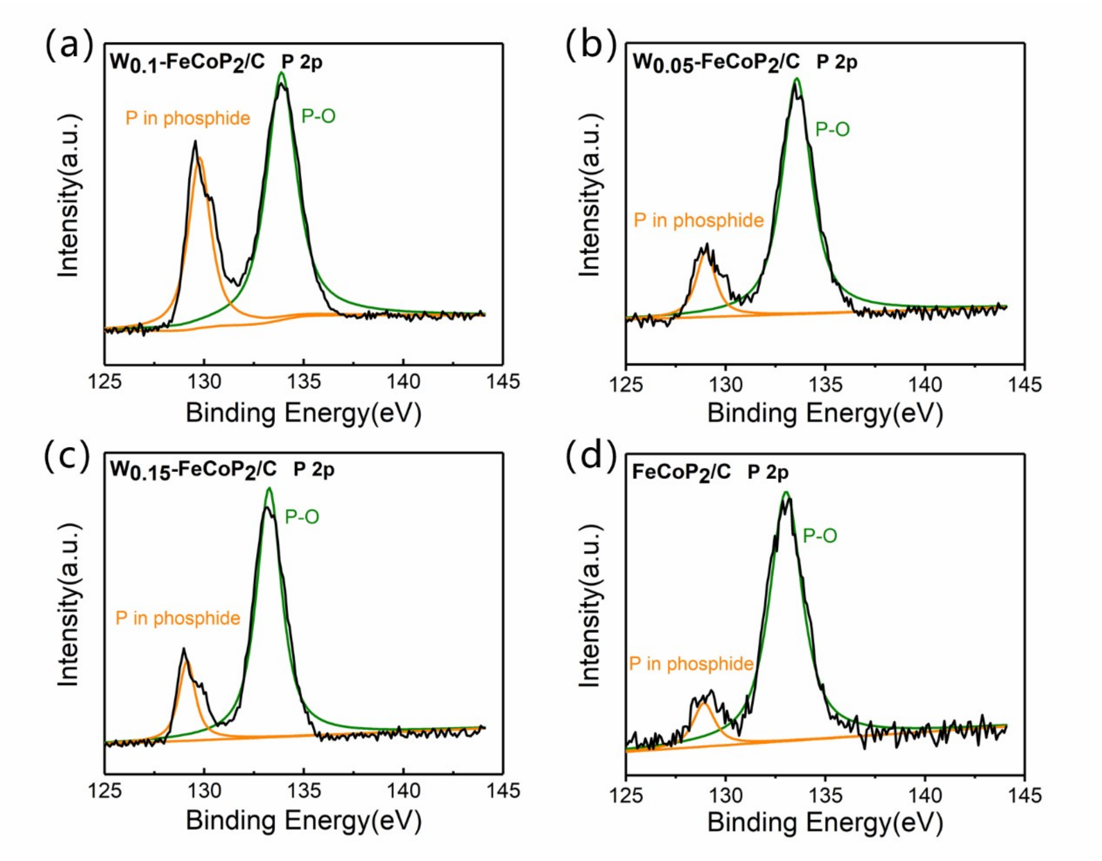

Figure S6. P 2p XPS spectra of $FeCoP_2/C$，$W_{0.05}$-$FeCoP_2/C$, $W_{0.1}$-$FeCoP_2/C$ and $W_{0.15}$-$FeCoP_2/C$

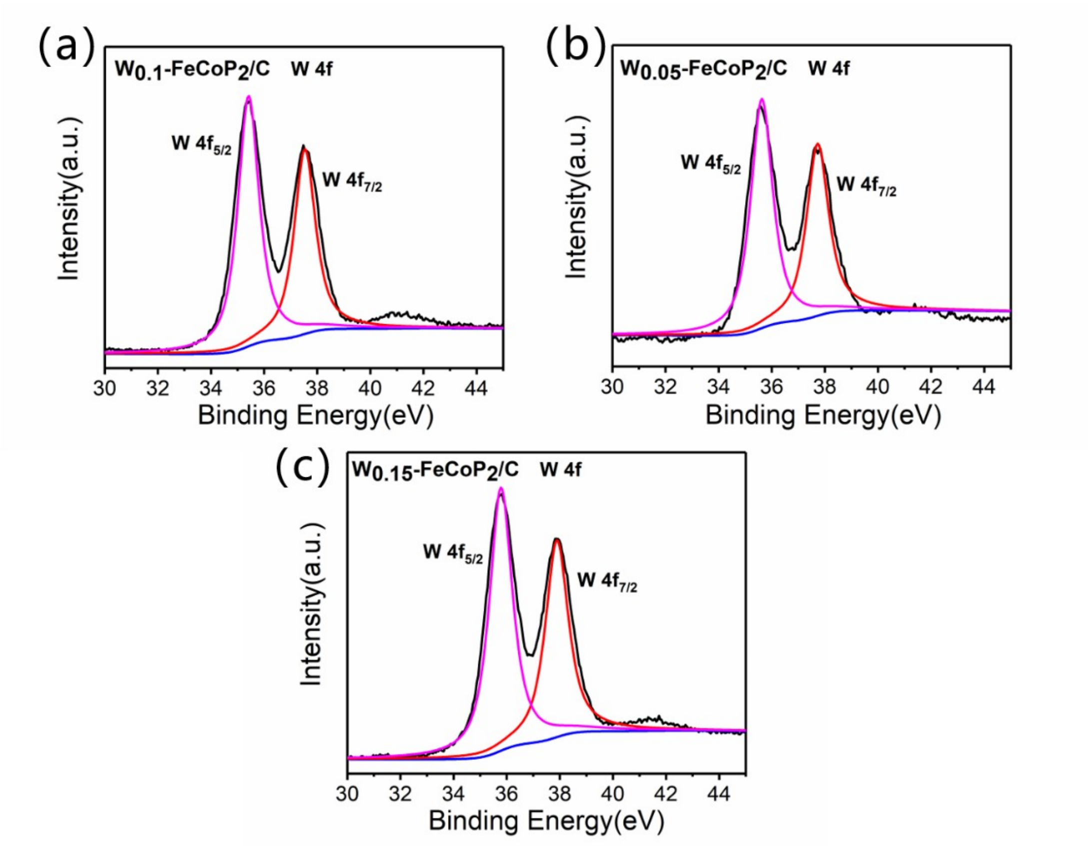

Figure S7. W 4f XPS spectra of $FeCoP_2/C$，$W_{0.05}$-$FeCoP_2/C$, $W_{0.1}$-$FeCoP_2/C$ and $W_{0.15}$-$FeCoP_2/C$

Table S4. OER performances of recently reported representative electrocatalysts in 1 M KOH electrolyte

Catalysts	Overpotential	Electrolyte	Reference
Fe-Co-P Alloy Hollow Spheres on GCE	252 mV@10 mA cm^{-2}	1.0 M KOH	[1]
NiCoP/C Nanoboxes on GCE	330 mV@10 mA cm^{-2}	1.0 M KOH	[2]
NiCoP/SCW	220 mV@10 mA cm^{-2}	1.0 M KOH	[3]
Mo-doped CoP Nanoarrays on carbon cloth	305 mV@10 mA cm^{-2}	1.0 M KOH	[4]
O-doped CoP@ RGO on GCE	280 mV@10 mA cm^{-2}	1.0 M KOH	[5]
Co/CoP Nanoparticles on GCE	340 mV@10 mA cm^{-2}	1.0 M KOH	[6]
Amorphous NiFeP on GCE	219 mV@10 mA cm^{-2}	1.0 M NaOH	[7]
Sulfur-doped Co_2P on Ni Foam	360 mV@100 mA cm^{-2}	1.0 M KOH	[8]
FeCoNiP on carbon cloth	270 mV@100 mA cm^{-2}	1.0 M KOH	[9]
W_x-FeCoP_2/C	**264 mV@10 mA cm^{-2}** **310 mV@100 mA cm^{-2}**	**1.0 M KOH**	**This work**

Table S5. The C_{dl} and the fitted Rct of $FeCoP_2/C$, $W_{0.05}$-$FeCoP_2/C$, $W_{0.1}$-$FeCoP_2/C$ and $W_{0.15}$-$FeCoP_2/C$

Samples	**C_{dl} (mF cm^{-2})**	**Rct (Ω)**
$FeCoP_2/C$	5.78	16.14
$W_{0.05}$-$FeCoP_2/C$	6.25	12.57
$W_{0.1}$-$FeCoP_2/C$	7.15	7.86
$W_{0.15}$-$FeCoP_2/C$	6.78	9.85

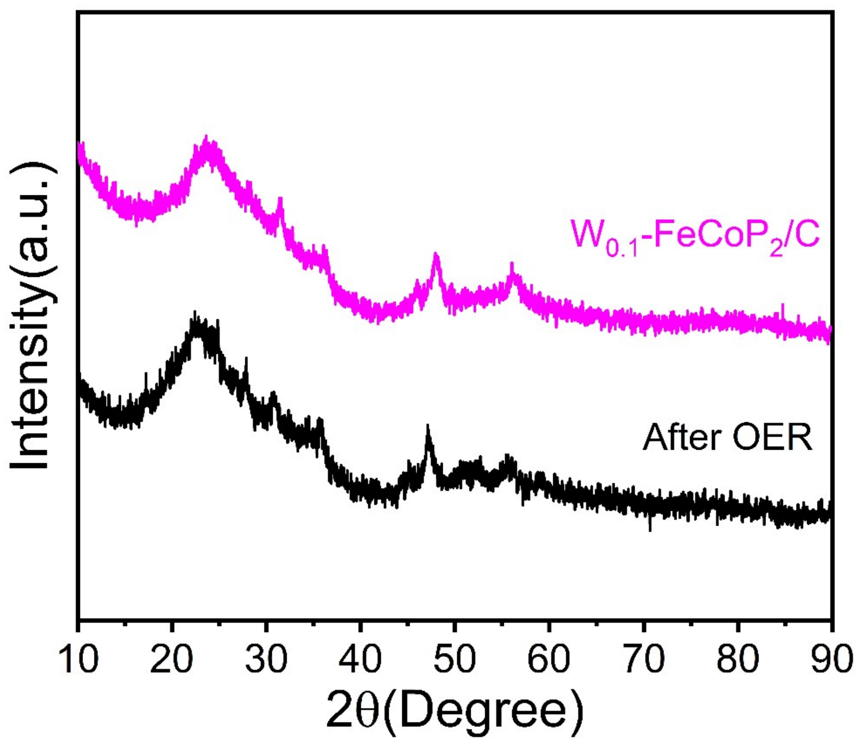

Figure S8. XRD patterns of the $W_{0.1}$-$FeCoP_2/C$ and the $W_{0.1}$-$FeCoP_2/C$ after OER tests

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