Supporting information

Transformation of homobimetallic MOFs to nickel-cobalt phosphide/nitrogen-doped carbon polyhedral nanocages for efficient oxygen evolution electrocatalysts

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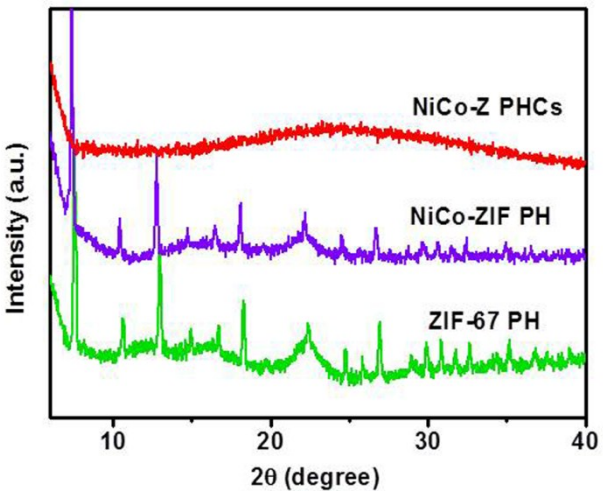

Fig. S1 XRD patterns of NiCo-Z PHCs, NiCo-ZIF PH, and ZIF-67 PH.

Fig. S2 The picture of solid samples of NiCo-ZIF PH, NiCo-Z PHCs, and NiCoP/NC PHCs.

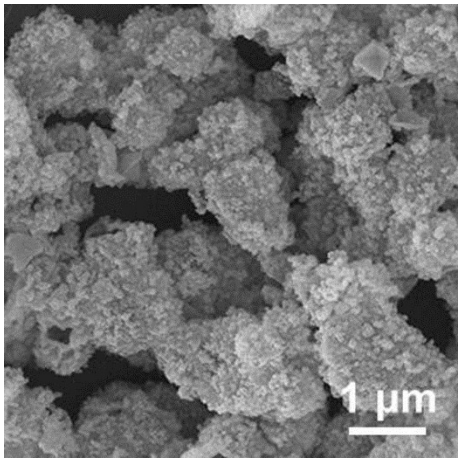

Fig. S3 SEM image of the scale-up synthesis of NiCo-Z PHCs by using 200 mg of NiCo-ZIF PH and 100 mL of methanol solution containing 500 mg of tannic acid.

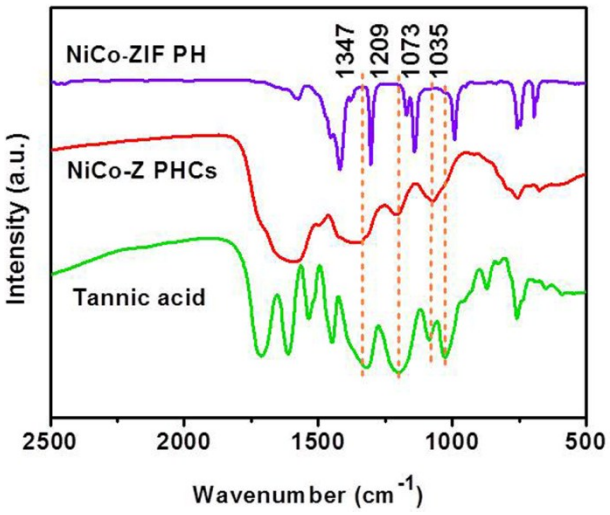

Fig. S4 FT-IR spectra of NiCo-ZIF PH, NiCo-Z PHCs, and tannic acid.

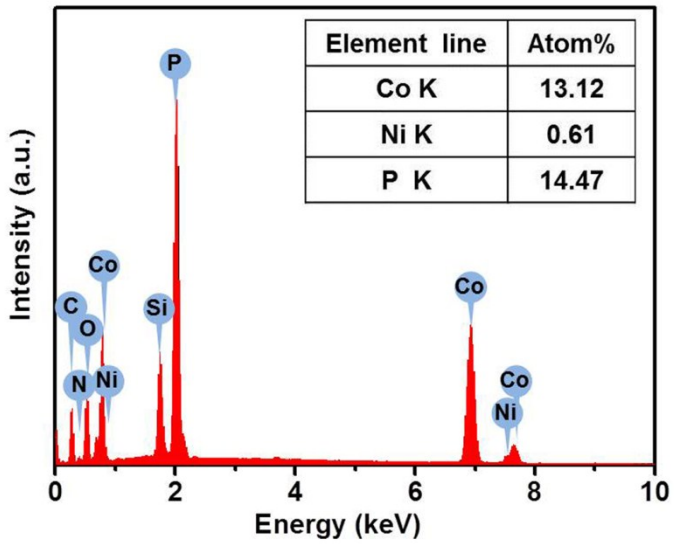

Fig. S5 EDX spectrum of NiCoP/NC PHCs.

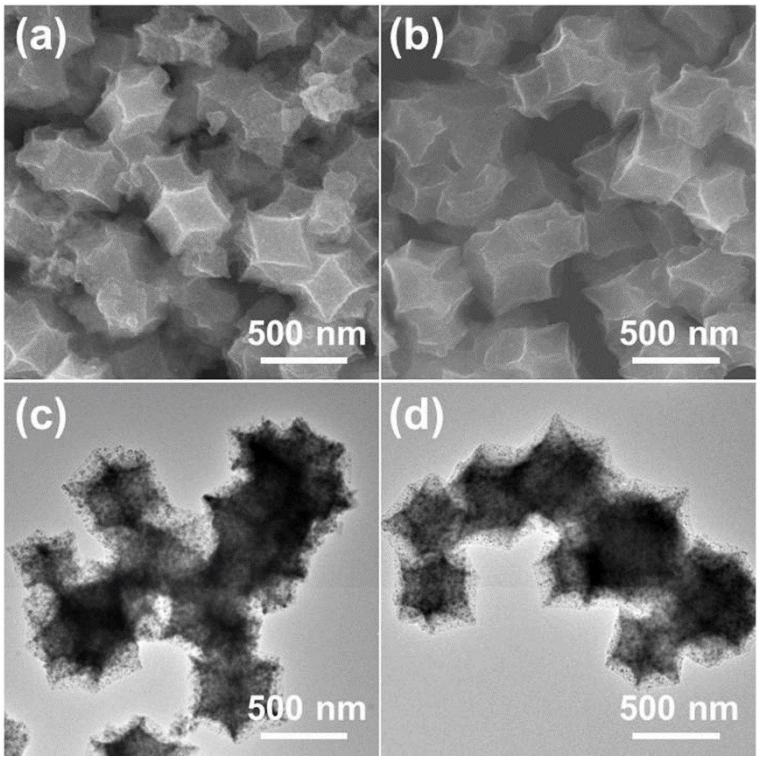

Fig. S6 SEM and TEM images of (a, c) NiCoP/NC PH and (b, d) CoP/NC PH.

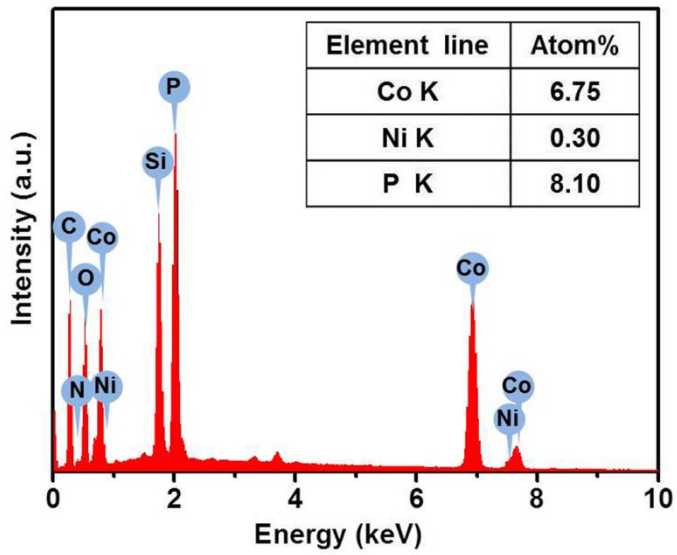

Fig. S7 EDX spectrum of NiCoP/NC PH.

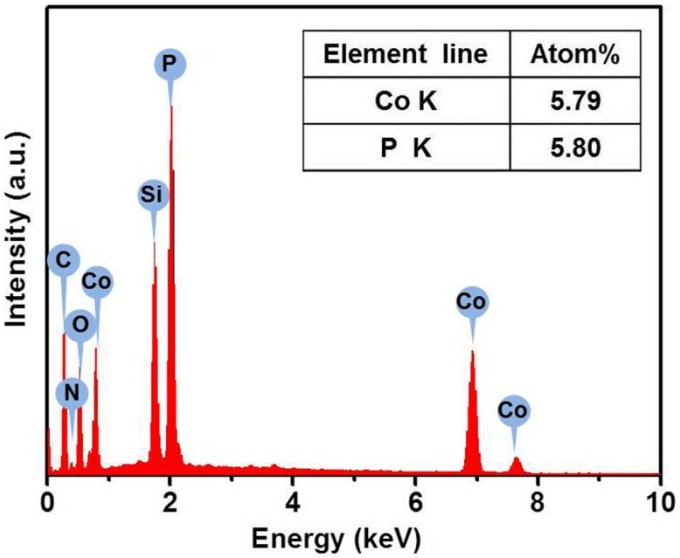

Fig. S8 EDX spectrum of CoP/NC PH.

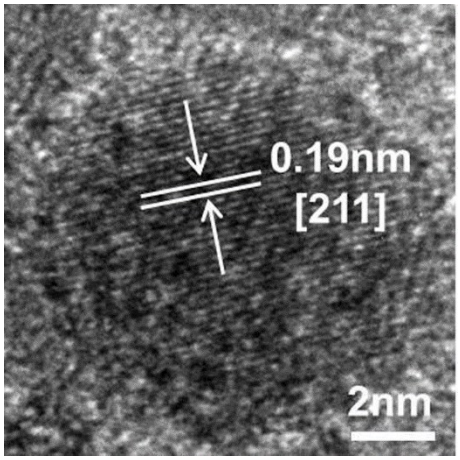

Fig. S9 HR-TEM images of NiCoP/NC PHCs.

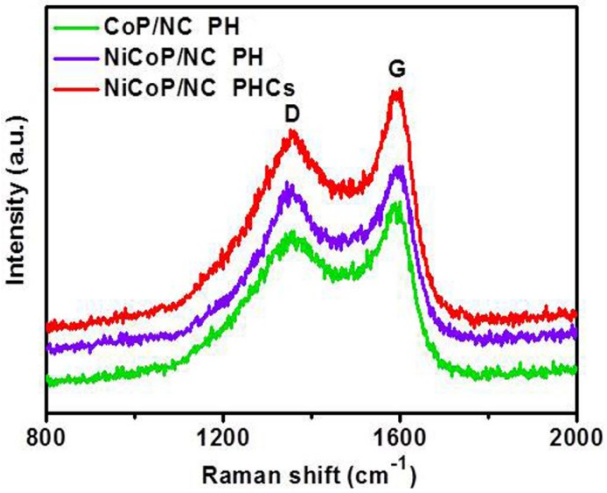

Fig. S10 Raman spectra of NiCoP/NC PHCs, NiCoP/NC PH and CoP/NC PH.

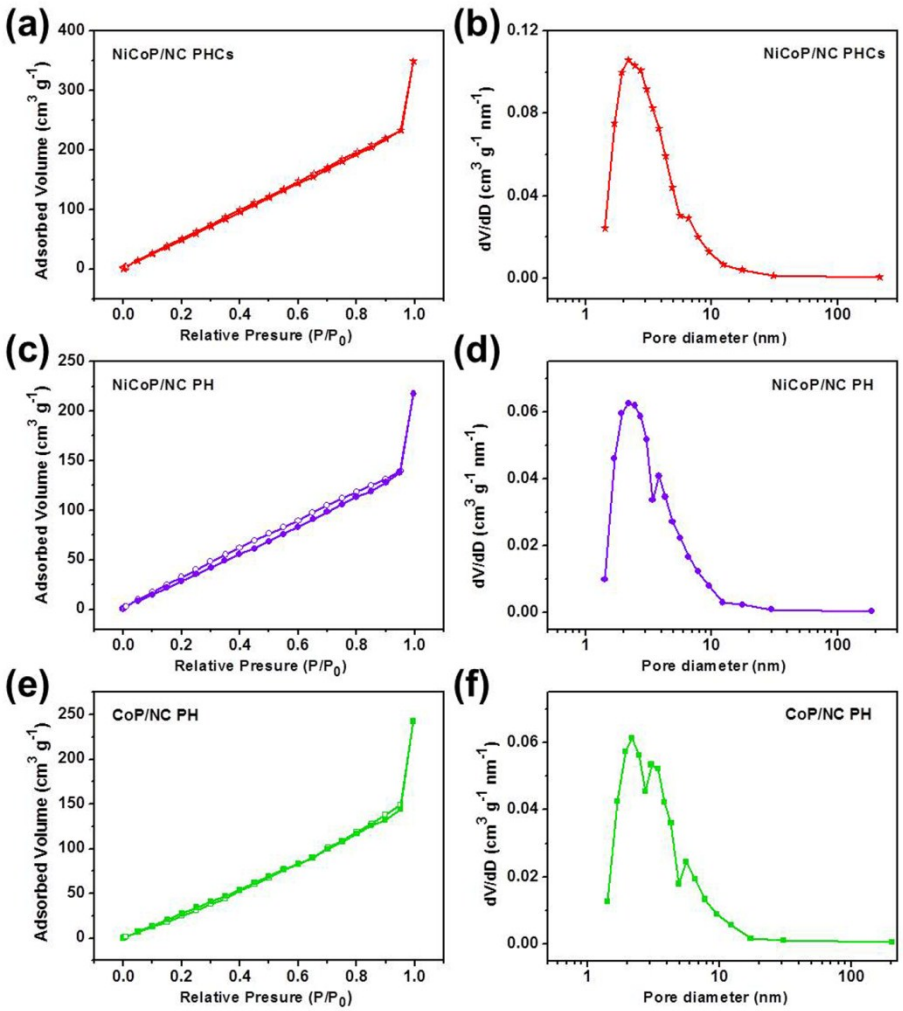

Fig. S11 Nitrogen adsorption and desorption isotherms and BJH pore distribution of (a, b) NiCoP/NC PHCs, (c, d) NiCoP/NC PH and (e, f) CoP/NC PH.

Table S1. The surface area and pore volume of different samples

Sample	S_{BET} ($m^2 g^{-1}$)	V_{pore} ($cm^3 g^{-1}$)	D_{BJH} (nm)
NiCoP/NC PHCs	**384.6**	**0.662**	**2.188**
NiCoP/NC PH	235.0	0.406	2.191
CoP/NC PH	219.7	0.447	2.190

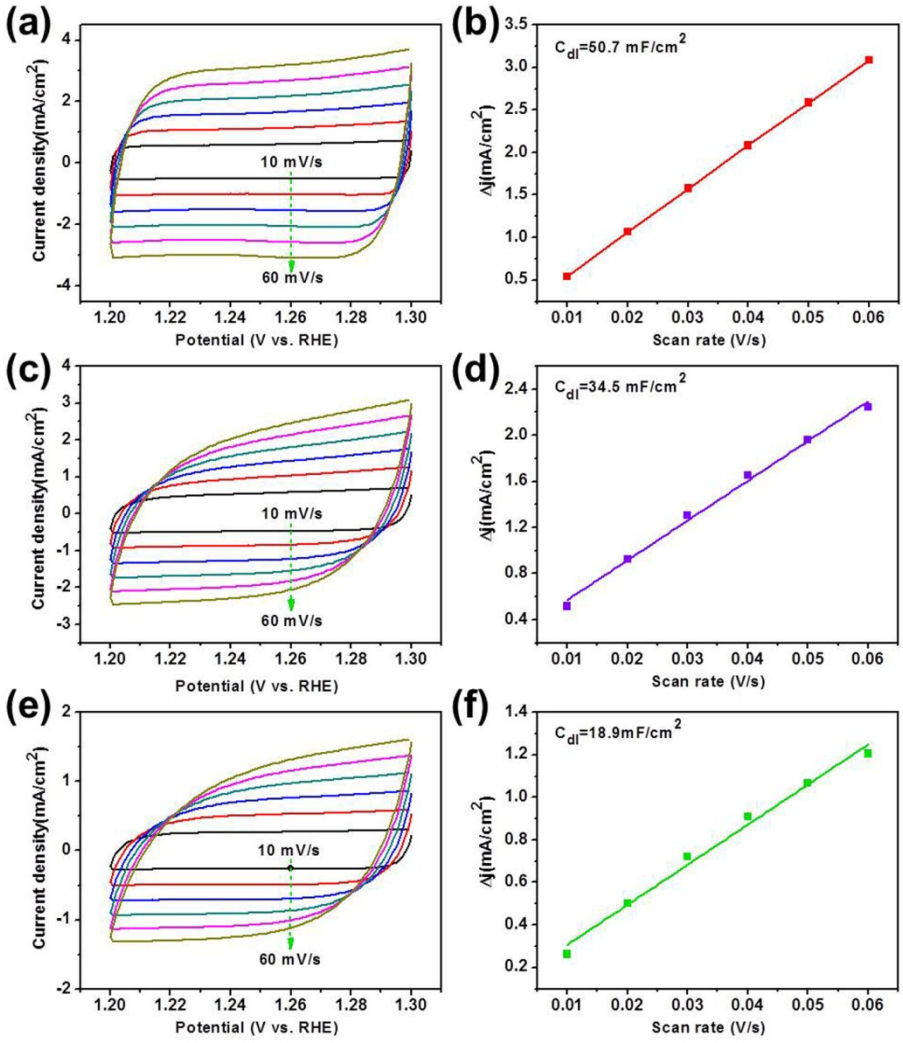

Fig. S12 CV curves of (a) NiCoP/NC PHCs, (c) NiCoP/NC PH and (e) CoP/NC PH in the double layer region at scan rates of 10-60 mV s^{-1} in 1.0 M KOH. (b), (d), and (f) current density as a function of scan rate derived from (a), (c) and (e), respectively.

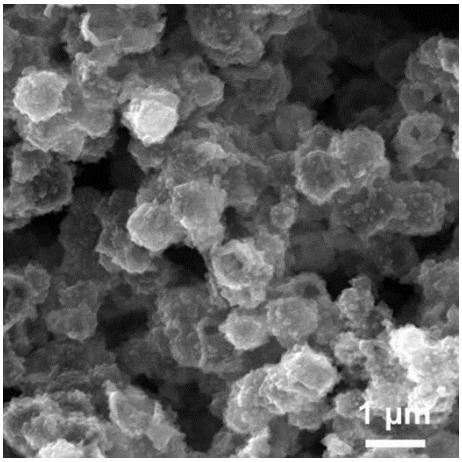

Fig. S13 SEM image of NiCoP/NC PHCs after long-term stability test.

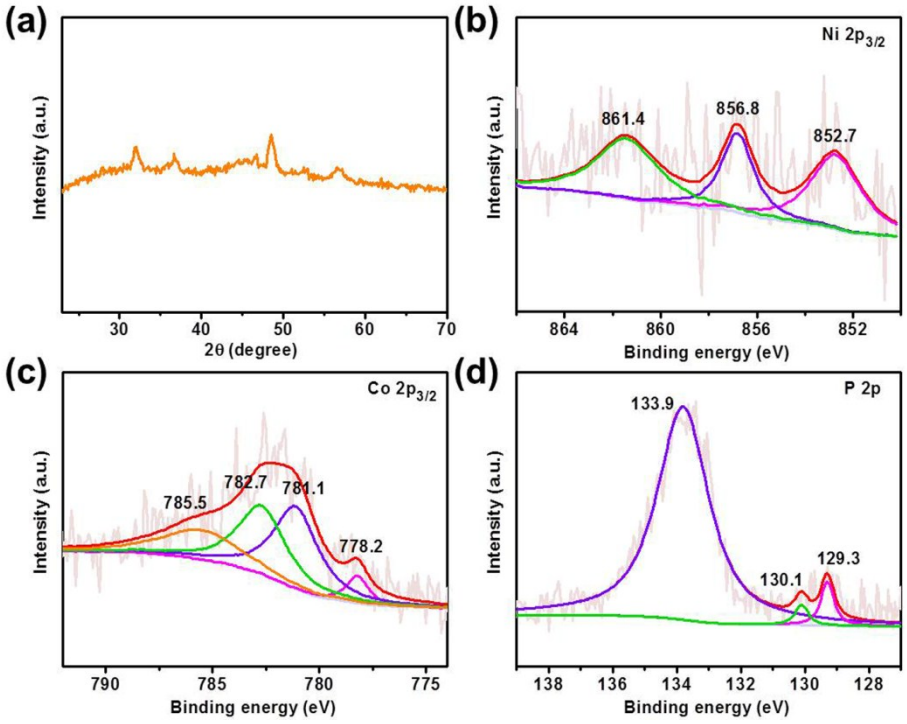

Fig. S14 (a) XRD pattern of NiCoP/NC PHCs, and the high resolution XPS spectra of (b) Ni $2p_{3/2}$, (c) Co $2p_{3/2}$, and (d) P 2p after long-term stability test.

Table S2. Comparison of the OER electrocatalytic performance for different catalysts.

Catalysts	Overpotential (mV) at 10 mA/cm^2	Reference
NiCoP/NC PHCs	**297**	**This work**
NiCoP/C nanoboxes	330	*Angew. Chem. Int. Ed.* ***2016****, 55, 10381*
MnCoP nanoparticles	330	*J. Am. Chem. Soc.* ***2016****, 138, 4006*
NiCoP microspheres	340	*Adv. Mater. Interfaces* ***2016****, 3, 1500454*
Co-Fe-P nanoparticles	280	*Angew. Chem. Int. Ed.* ***2015****, 54, 9642*
CoP hollow polyhedron	400	*ACS Appl. Mater. Interfaces* ***2016****, 8, 2158*
Co-P/NC nanopolyhedrons	354	*Chem. Mater.* ***2015****, 27, 7636*
Ni_2P nanoparticles	290	*Energy Environ. Sci.* ***2015****, 8, 2347*
Co-NC@CoP-NC	330	*J. Mater. Chem. A,* ***2016****, 4, 15836*
Co_2P/Co-foil	319	*J. Mater. Chem. A,* ***2017****,5, 10561*
Co-P-foam	300	*J. Mater. Chem. A,* ***2016****, 4,*

Note: All the overpotentials were measured in 1.0 M KOH.