Electronic Supplementary Information

Modulating the electronic configuration of Co species in MOF/MXene nanosheets derived Co-based mixed spinel oxides for efficient oxygen evolution reaction

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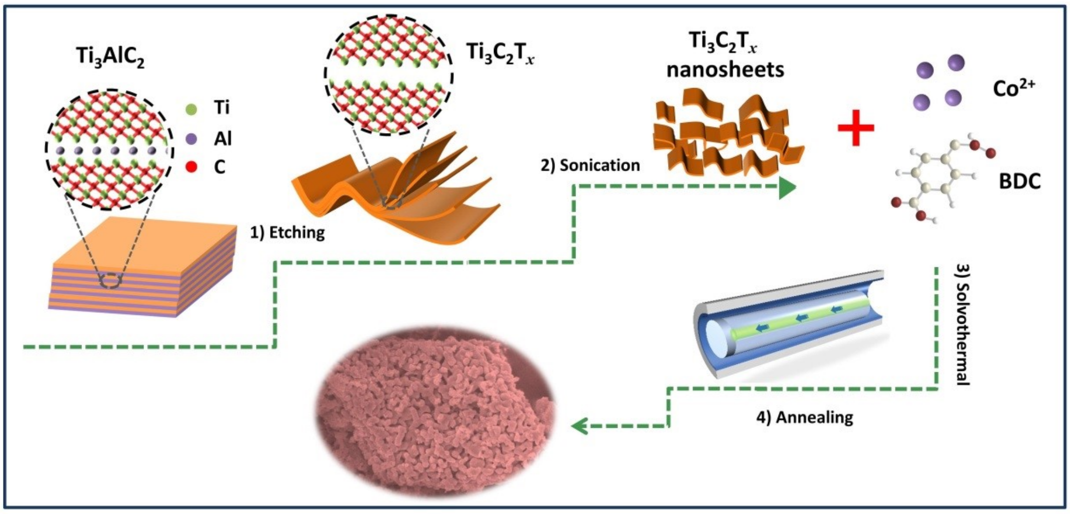

Fig. S1. The preparation process of the Co-based mixed spinel oxides.

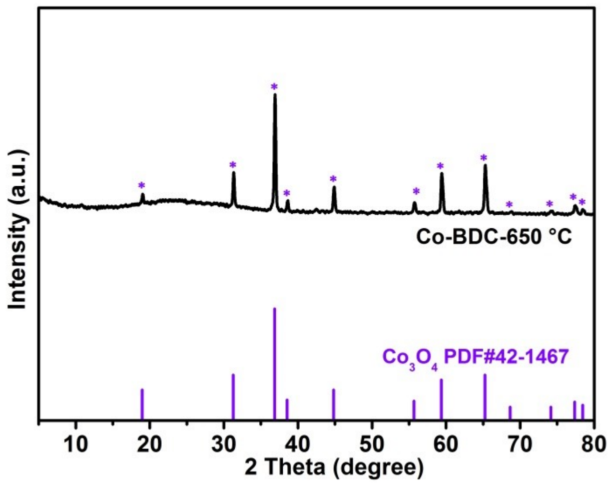

Fig. S2. XRD pattern of Co-BDC annealed at 650℃.

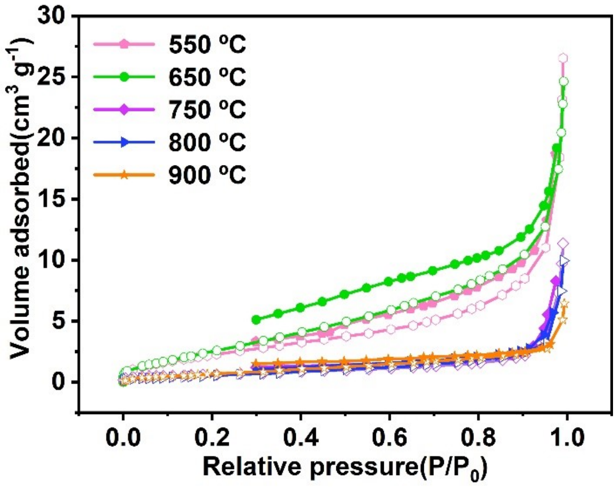

Fig. S3. Nitrogen adsorption and desorption curves of the $CoTiO_x$-T. All samples show type-IV isotherms with a very distinct hysteresis loop of typical H3. The BET surface area of the $CoTiO_x$-650 is 12.3 m^2 g^{-1}, which is larger than that of $CoTiO_x$-550 (9.5 m^2 g^{-1}), $CoTiO_x$-750 (2.3 m^2 g^{-1}), $CoTiO_x$-800 (2.5 m^2 g^{-1}), $CoTiO_x$-900 (3.1 m^2 g^{-1}).

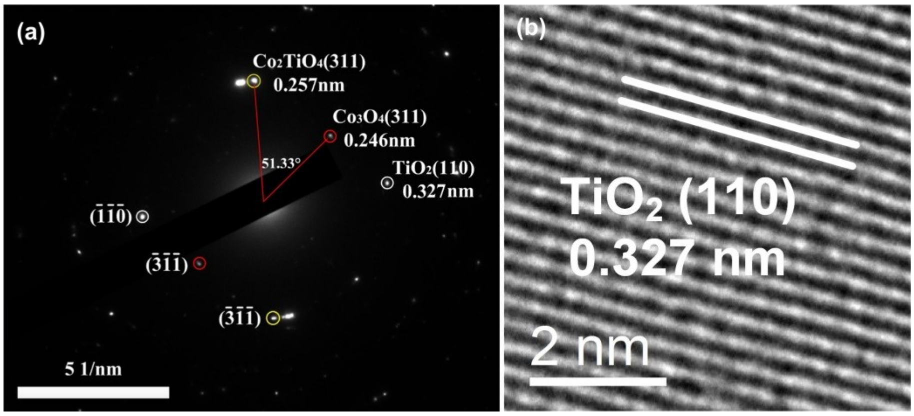

Fig. S4. (a) The selected area electron diffraction (SAED) image and (b) HRTEM image of CoTiO$_x$-650.

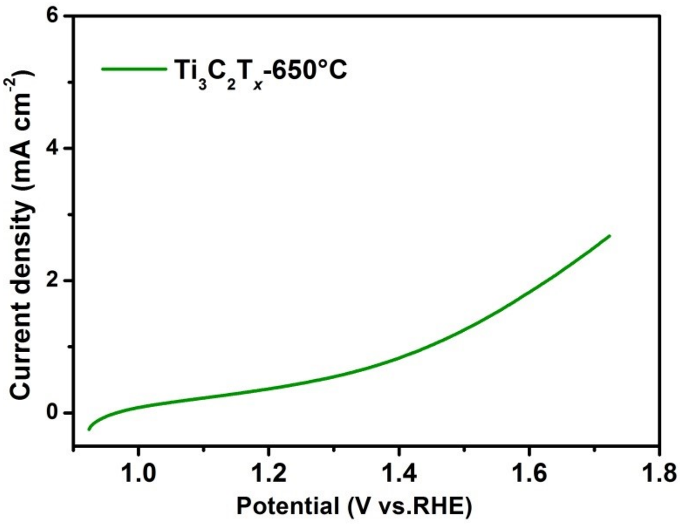

Fig. S5. The polarization curve of OER on $Ti_3C_2T_x$ annealed at 650 °C. It can be seen that the annealed product TiO_2 has almost no OER activity.

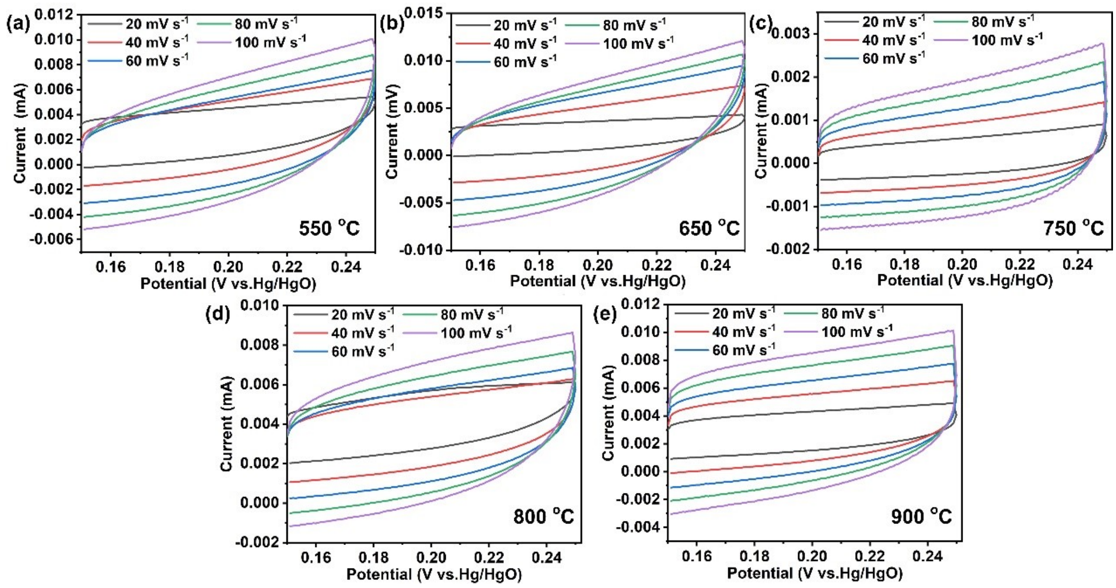

Fig. S6. Cyclic voltammetric curves of different samples.

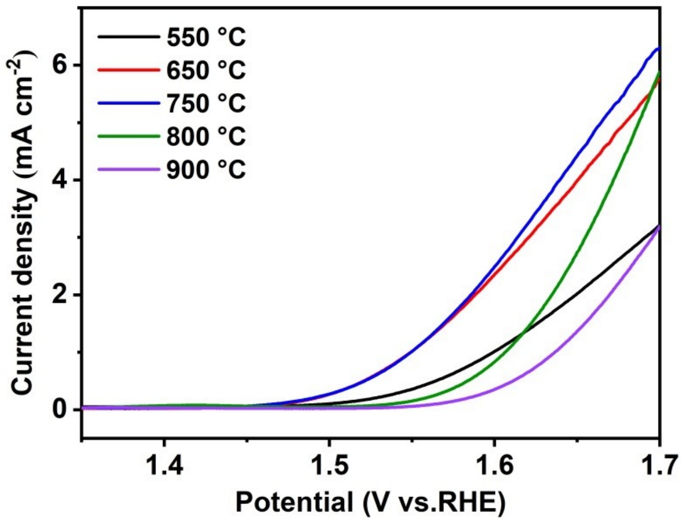

Fig. S7. C_{dl}-normalized polarization curves for $CoTiO_x$-T catalysts.

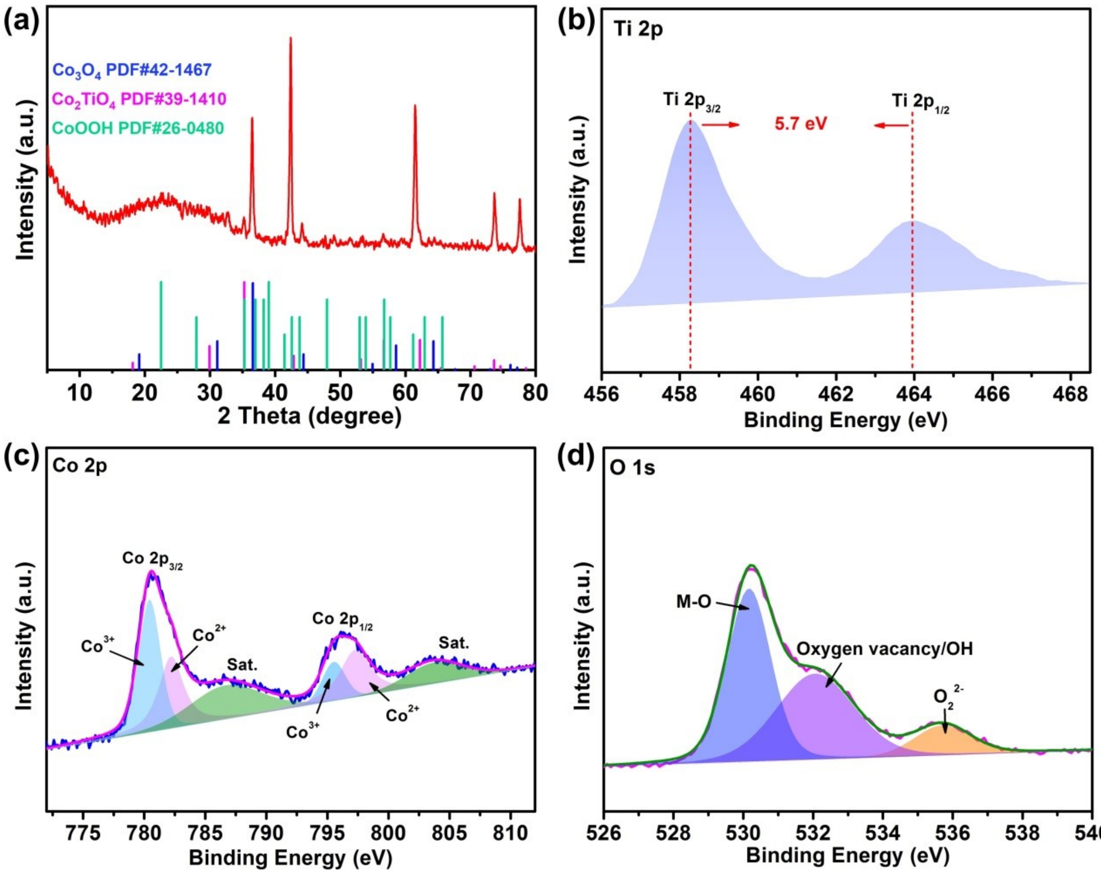

Fig. S8. The XRD and XPS of $CoTiO_x$-650 after stability test.

Table S1. Comparison of the overpotential at 10 mA cm^{-2} of present work and the other OER catalysts in a three-electrode system

Catalyst	Overpotential 10 mA cm^{-2} (mV)	Electrolyte	Support	Reference
$CoTiO_x$-650	**260**	**1M KOH**	**NF**	This work
	280	**1M KOH**	**GC**	
NNU-23 (Fe_2Ni-MOF)	365	0.1m KOH	CC	Angew. Chem. Int. Ed., 2018, 57, 9660
Co-BDC nanosheets	371	1M KOH	GC	Nat. Energy, 2016, 1, 16184
NiO/CoN PINWs	300	0.1M KOH	CC	ACS Nano, 2017, 11, 2275
Ni-MOF@Fe-MOF powder	265	1M KOH	GC	Adv. Funct. Mater., 2018, 28, 1801554
FeNi-BTC	270	0.1 M KOH	NF	ACS Appl. Mater. Interfaces, 2016, 8 , 16736
Co-PB/Pt	300	1M KOH	GC	ACS Sustainable Chem. Eng., 2017, 5, 11577
$Co(TCNQ)_2$	310	1M KOH	Co foil	Chem. Eur. J., 2018, 24, 2075
TiC_2TX-CoBDC	410	0.1M KOH	GC	ACS Nano, 2017, 11, 5800
Fe:2D-Co-NS	282	0.1M KOH	GC	Angew. Chem. Int. Ed., 2018, 57, 4632
Co_3O_4-based catalysts	260	1M KOH	CC	Angew. Chem. Int. Ed., 2020, 59, 6929-6935
Co_3O_4-Ag@B	270	1M KOH	GC	Applied Catalysis B: Environmental, 2021, 298, 120529
Co_3O_4/Ti_3C_2	300	1M KOH	GC	Sci. Bull., 2020, 65, 460
Ni-MOF@Fe-MOF powder	265	1M KOH	GC	Adv. Funct. Mater., 2018, 28, 1801554
n-Co_3O_4	380	1M KOH	GC	ACS Appl. Energy Mater., 2020, 3, 5439
Fe-Co-O nanosheets	260	1M KOH	GC	Small, 2020, 16, 2001571
Co_3O_4/rGO	290	1M KOH	CF	Chem. Eur. J., 2017, 23, 4010
Co@Co_3O_4	333	1M KOH	GC	ACS Catal., 2018, 8, 7879
Co_3O_4@CMC	290	1M KOH	GC	Electrochim. Acta, 2021, 398, 139338