Electronic Supplementary Information for

The synthesis of iron-doped 3D ordered mesoporous cobalt phosphide material to towards Efficient Electrochemical Overall Water Splitting

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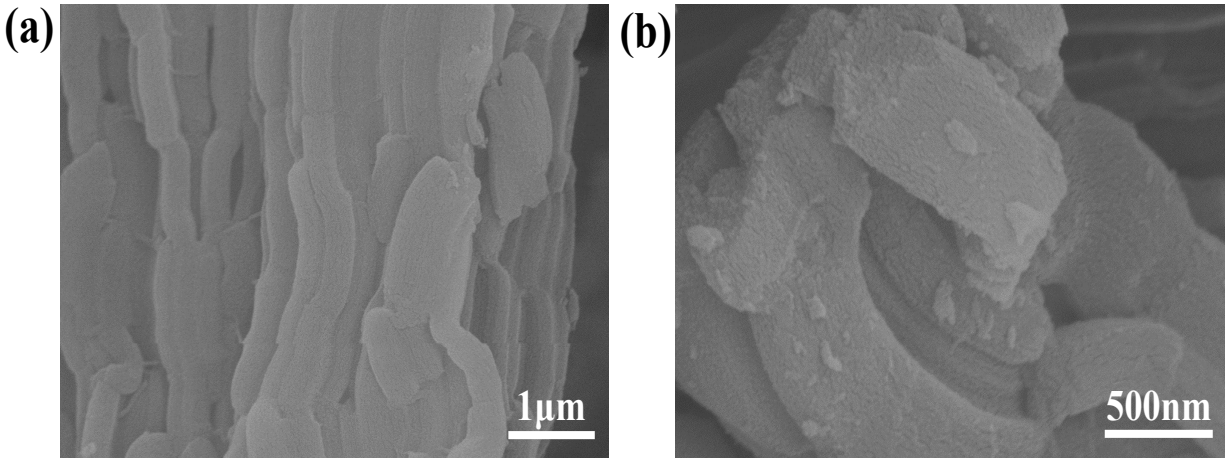

Fig. S1 SEM image of the as-synthesized SBA-15.

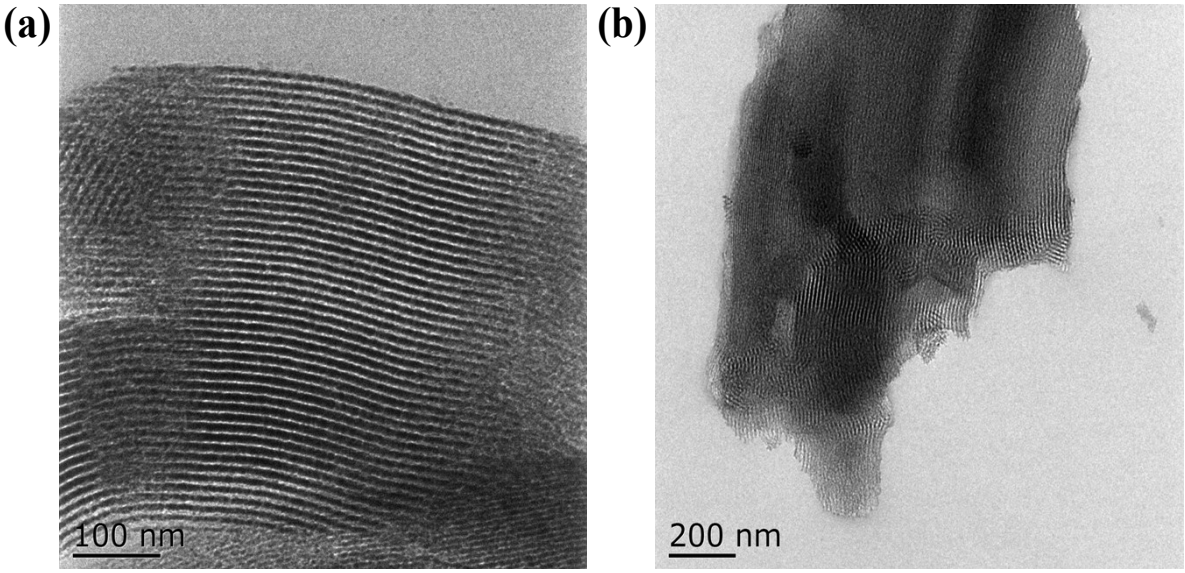

Fig. S2 TEM image of the as-synthesized SBA-15.

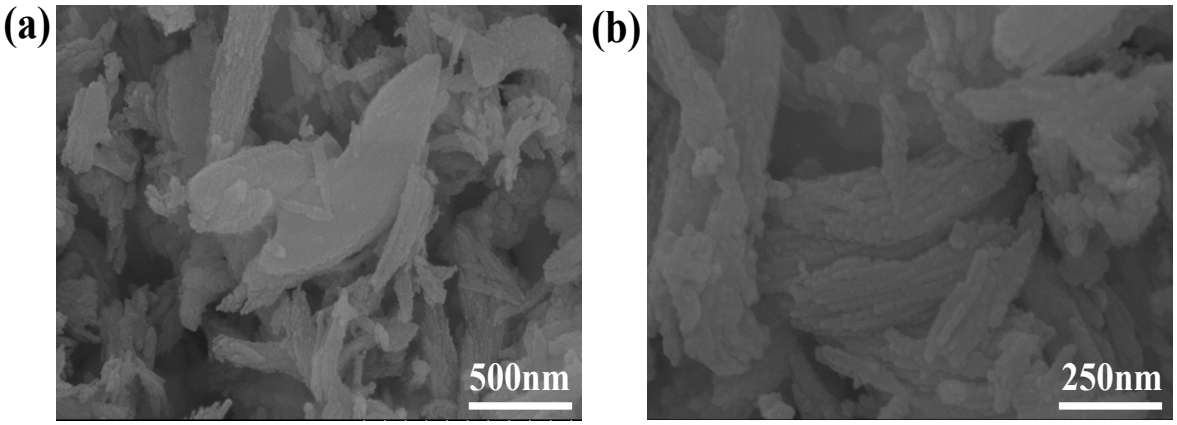

Fig. S3 SEM image of the as-synthesized Meso-CoP.

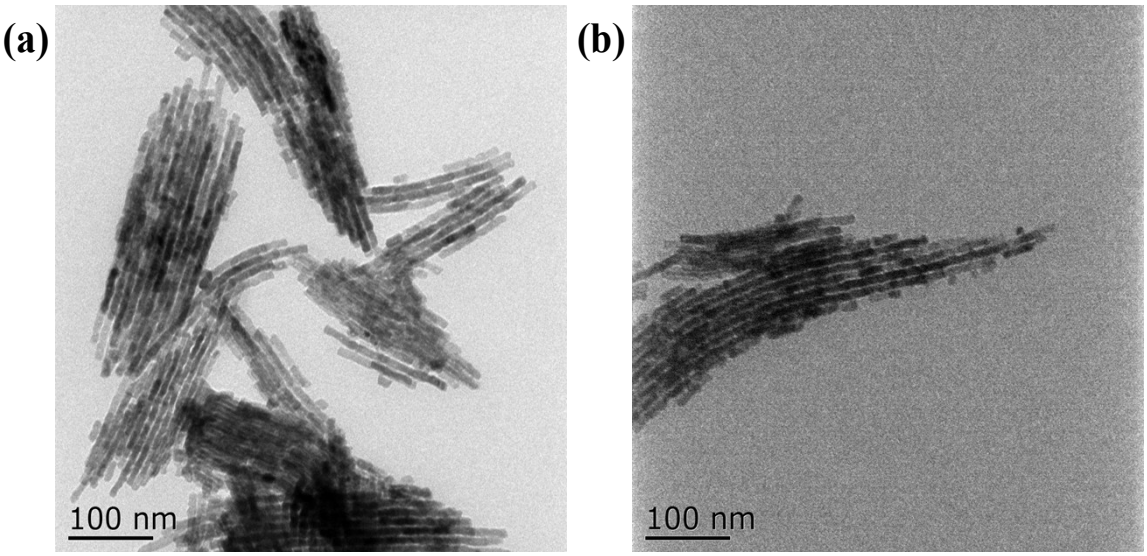

Fig. S4 TEM image of the as-synthesized Meso-Co_2P.

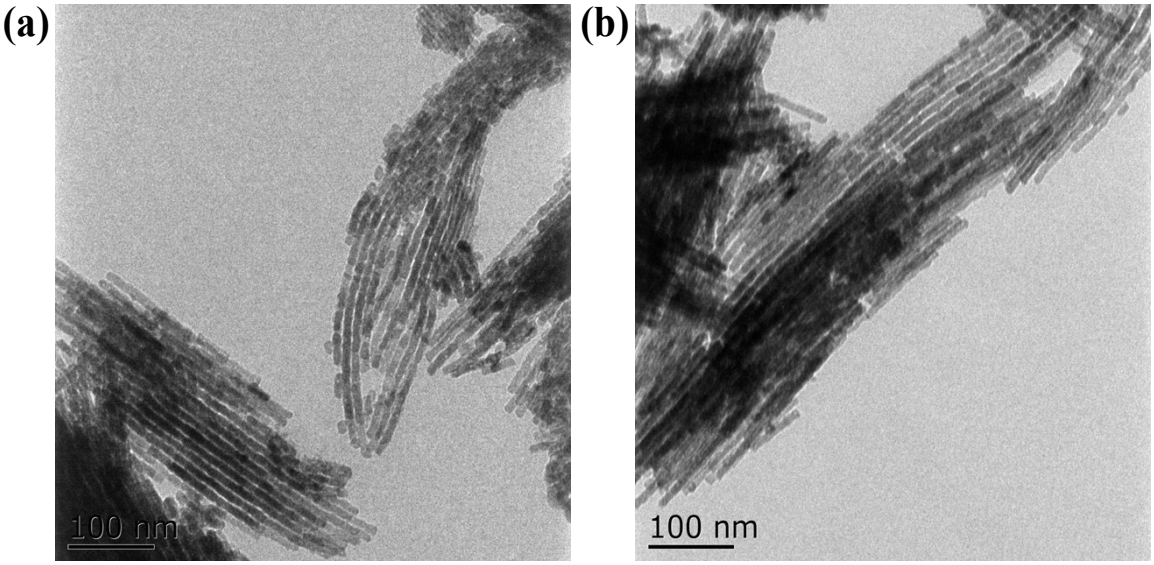

Fig. S5 SEM image of the as-synthesized Meso-Co_3O_4.

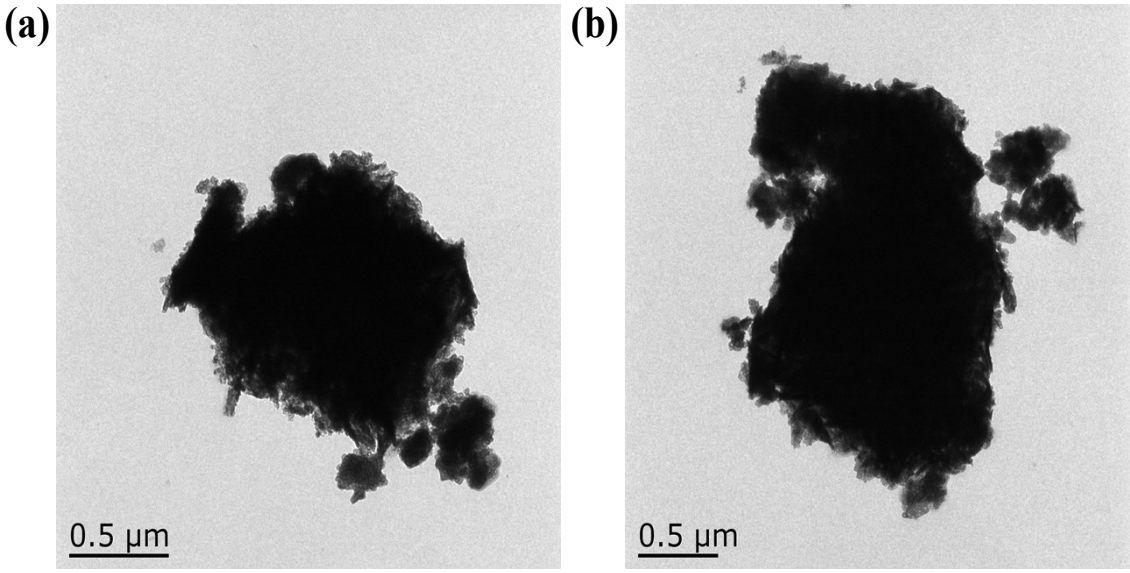

Fig. S6 SEM image of the as-synthesized Bulk-Co_2P.

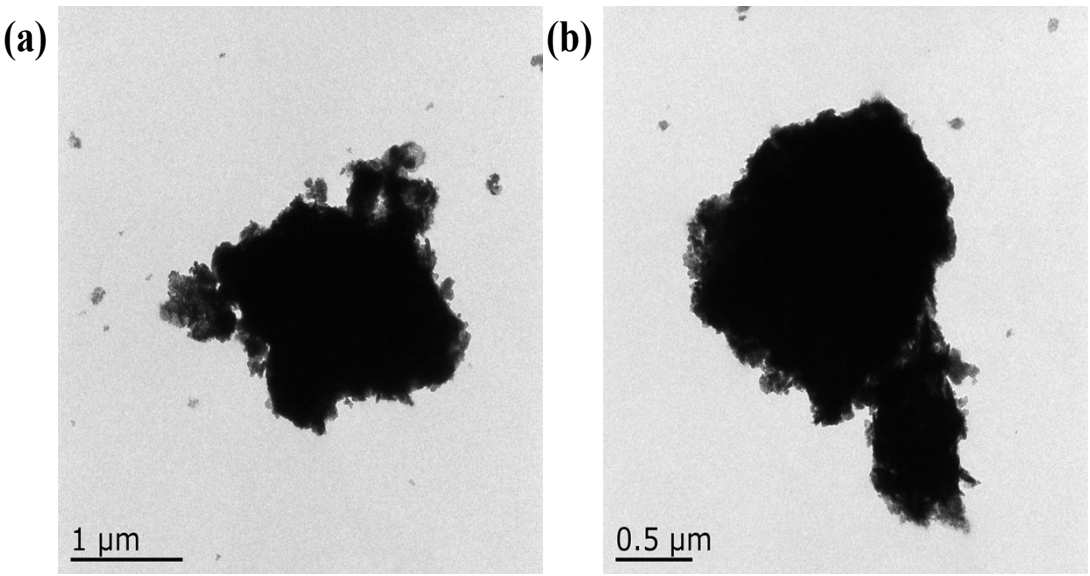

Fig. S7 SEM image of the as-synthesized Bulk-$Co_{1.8}Fe_{0.2}P$.

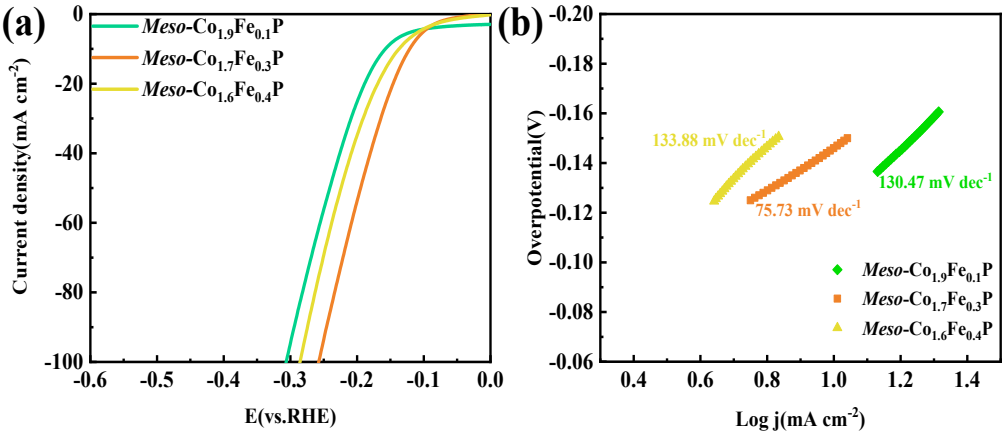

Fig. S8 (a) Linear sweep polarization curves of different iron additions for the HER at a scan rate of 2 mV s-1 in 1 M KOH solution; (b) Tafel plots.

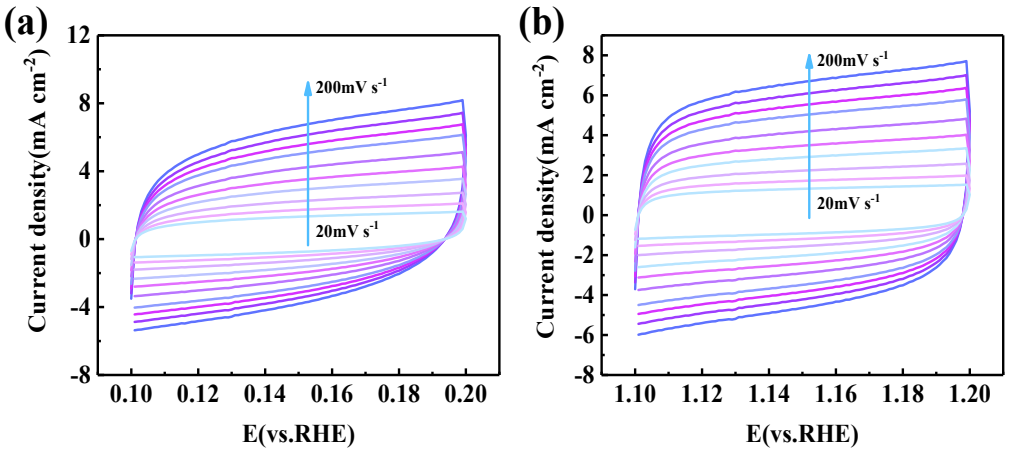

Fig. S9 CV curves measured of Meso-$Co_{1.8}Fe_{0.2}P$ in 1 M KOH at the scan rates from 20 to 200 mV s^{-1} for (a) HER, (b) OER.

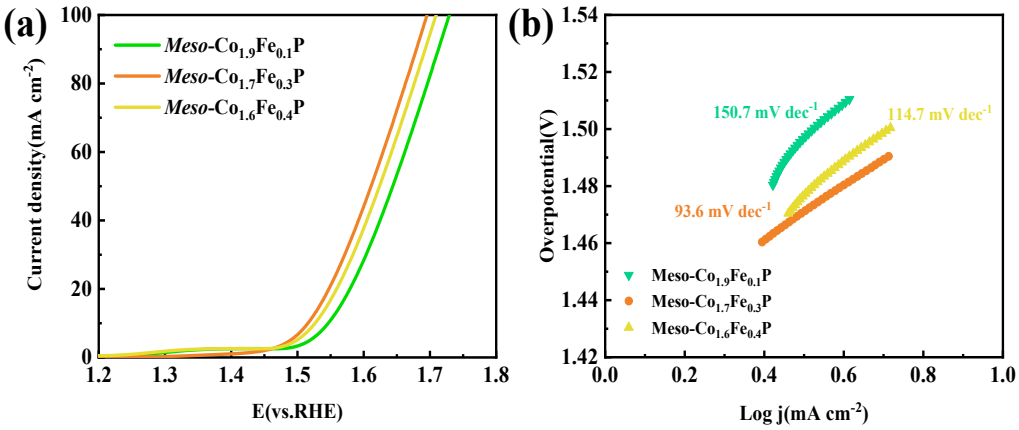

Fig. S10 (a) Linear sweep polarization curves of different iron additions for the HER at a scan rate of 2 mV s-1 in 1 M KOH solution; (b) Tafel plots.

Table S1. Elemental composition (atomic and weight percentage) obtained from ICP analysis.

Electrocatalysts	Weight % (Co, Fe)		Co/Fe (Atom ratio)
Meso-$Co_{1.9}Fe_{0.1}P$	**10.247**	**0.507**	**19.2:1**
Meso-$Co_{1.8}Fe_{0.2}P$	**11.886**	**1.261**	**17.9:2**
Meso-$Co_{1.6}Fe_{0.4}P$	**10.845**	**2.526**	**16.3:4**

Table S2. The simulated series resistance (R_s) and charge transfer resistance (R_{ct}) in the presence of as-prepared electrodes.

Sample	Reaction	R_{ct} (Ω)	R_1 (Ω)
Meso-$Co_{1.8}Fe_{0.2}P$	HER	42.7	20.29
	OER	17.6	10.13
Meso-Co_2P	HER	83.4	21.21
	OER	58.2	10.29
Bulk-$Co_{1.8}Fe_{0.2}P$	HER	110.7	20.15
	OER	90.5	10.46
Bulk-Co_2P	HER	166.1	21.10
	OER	153.6	10.92

Table S3. Comparison of the catalytic activity toward the HER in 1 M KOH of the Meso-$Co_{1.8}Fe_{0.2}P$ with other reported high performance HER catalysts.

Catalyst	**η (mV) at J = 10 mA cm^{-2}**	**Tafel slope (mV dec^{-1})**	**Reference**
Meso-$Co_{1.8}Fe_{0.2}P$	93.7	84.5	This Work
o-$CoSe_2$|P	104	96	[1]
$(Co_{1-x}Ni_x)(S_{1-y}P_y)_2$/G	117	85	[2]
f-CoP/CoP_2/Al_2O_3	138	76	[3]
CoP_3/Ni_2P	115	49	[4]
Ni-CoP/HPFs	92	52	[5]
CoP_x/N-rGO	104	65	[6]
CoFe−Se−P	172.5	58	[7]
o-Co_2P	160	60.1	[8]
Ni-Co-P	150	60.6	[9]
$Co(S_{0.71}Se_{0.29})_2$	145	80.7	[10]
EG/H-$Co_{0.86}Se$|P	170	86	[11]
CoP@a-CoO_x	132	89	[12]
N-doped CoP_2/CC	64	47.4	[13]
NiP/CFP	100	85.4	[14]
Ni_2P/NF	150	86	[15]

Table S4. Comparison of the catalytic activity toward the OER in 1 M KOH of the Meso-$Co_{1.8}Fe_{0.2}P$ with other reported high performance OER catalysts.

Catalyst	**η (mV) at J = 10 mA cm^{-2}**	**Tafel slope (mV dec^{-1})**	**Reference**
Meso-$Co_{1.8}Fe_{0.2}P$	266.4	80.6	This Work
$(Co_{1-x}Ni_x)(S_{1-y}P_y)_2$/G	285	105	[2]
f-CoP/CoP_2/Al_2O_3	300	63	[3]
CoFe−Se−P	230	108	[7]
CoP@a-CoO_x	232	89	[12]
Co/Co_xM_y	334	79.2	[16]
Co_3O_4@BP	400	63	[17]
Fe–CoS_2	302	85	[18]
CeO_x/CoS@S–CeO_2	269	50	[19]
Fe/Co (1.3:100)	322	N/A	[20]
P-Co_3O_4	280	51.6	[21]
$(Co_4Mn_1)Se_2$	274	39	[22]
CMP@PNC	~330	88	[23]
N-C-CoFe	290	100	[24]
CoPPi	359	54.1	[25]
$CoNi_{0.2}Fe_{0.05}$-Z-H-P	329	48	[26]

Table S5. Comparison of the catalytic activity toward the overall water splitting in 1 M KOH of the Meso-$Co_{1.8}Fe_{0.2}P$ with other reported high performance bifunctional catalysts.

Catalyst	**Cell voltages (V) at J = 10mA cm^{-2}**	**Reference**
Meso-$Co_{1.8}Fe_{0.2}P$|| Meso-$Co_{1.8}Fe_{0.2}P$	1.58	This Work
$(Co_{1-x}Ni_x)(S_{1-y}P_y)_2$/G||$(Co_{1-x}Ni_x)(S_{1-y}P_y)_2$/G	1.65	[2]
f-CoP/CoP_2/Al_2O_3|| f-CoP/CoP_2/Al_2O_3	1.65	[3]
CoFe−Se−P|| CoFe−Se−P	1.59	[7]
CoP@a-CoO_x|| CoP@a-CoO_x	1.66	[12]
CMS-16h|| CMS-16h	1.71	[27]
np-$Co_9S_4P_4$|| np-$Co_9S_4P_4$	1.67	[28]
CoP/Co_9S_8|| CoP/Co_9S_8	1.6	[29]
CoPS/Al_2O_3-3|| CoPS/Al_2O_3-3	1.75	[30]
Co_2B/$CoSe_2$|| Co_2B/$CoSe_2$	1.73	[31]
Co1-xFex-LDH(+)‖ Ni1-xFex-LDH(-)	1.59	[32]
MoS_2/NPF $CoFe_2O_4$|| MoS_2/NPF $CoFe_2O_4$	1.58	[33]
CoP/NCNHP|| CoP/NCNHP	1.64	[34]
$NiCoSe_2$|| $NiCoSe_2$	1.62	[35]
P-Co_3O_4/NF|| P-Co_3O_4/NF	1.63	[36]
$Co_{0.75}Ni_{0.25}Se$/NF||$Co_{0.75}Ni_{0.25}Se$/NF	1.61	[37]

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