Electronic Supplementary Information

Hierarchical Oxygen Vacancies-Rich WO_3 with "Nanowire-Array-on-Nanosheet-Array" Structure for Highly Efficient Oxygen Evolution Reaction

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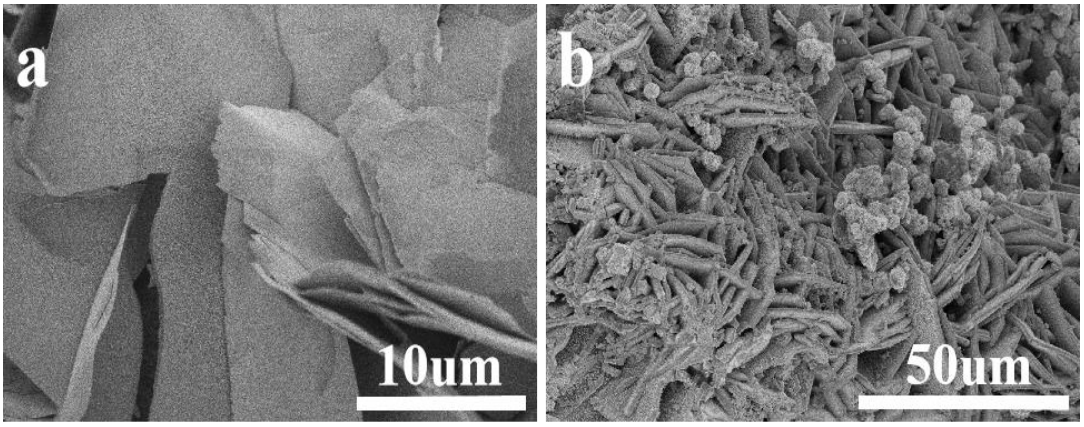

Fig. S1 The SEM image of WO_3 NSs (a) and disordered WO_3(b)

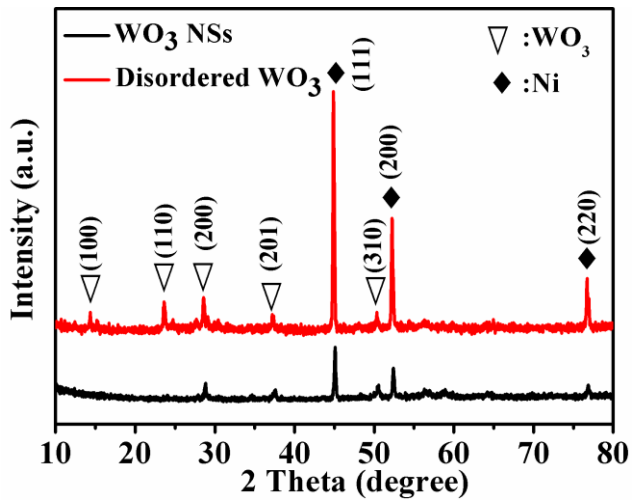

Fig. S2 The XRD patterns of WO_3 NSs and disordered WO_3

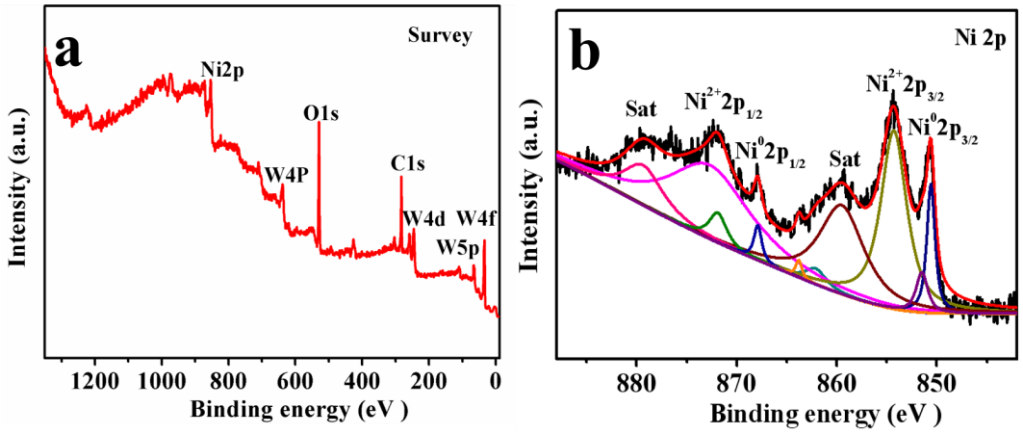

Fig. S3 The XPS survery spectra (a) and Ni 2p XPS spectra (b) of WO_3 NWA-NSA catalyst

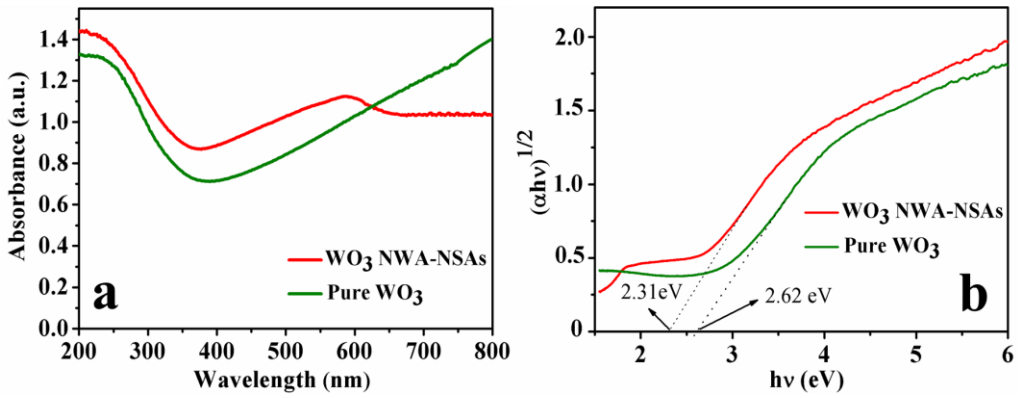

Fig. S4 (a) UV-vis spectra and (b) $\alpha h\gamma^{1/2}$ versus photon-energy plot of WO_3 NWA-NSA catalyst and pure WO_3

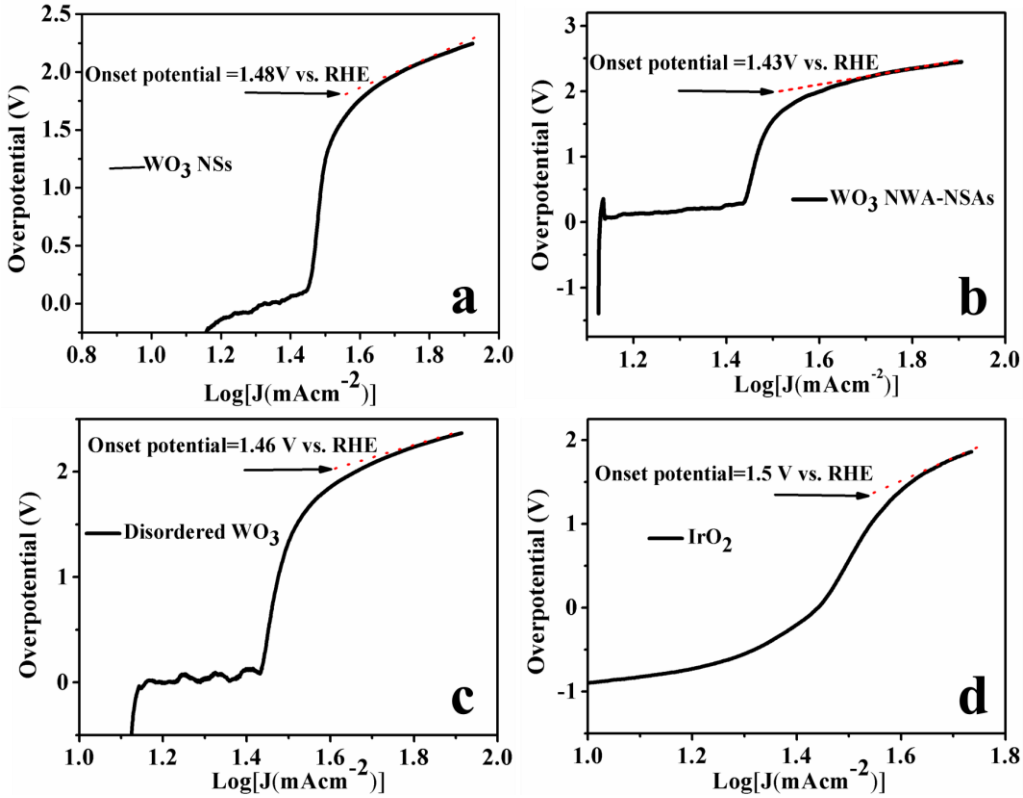

Fig. S5 The plots of overpotential vs. log[J/(mA cm^{-2})] for WO_3 NSs, WO_3 NWA-NSAs, disordered WO_3 and IrO_2, respectively

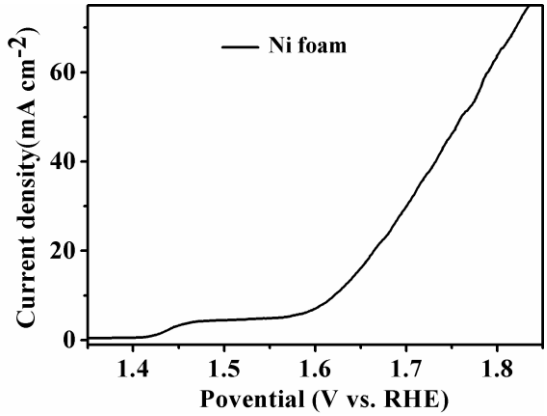

Fig. S6 LSV polarization curve of Ni foam treated under same condition for 6 h without the addition of ATT.

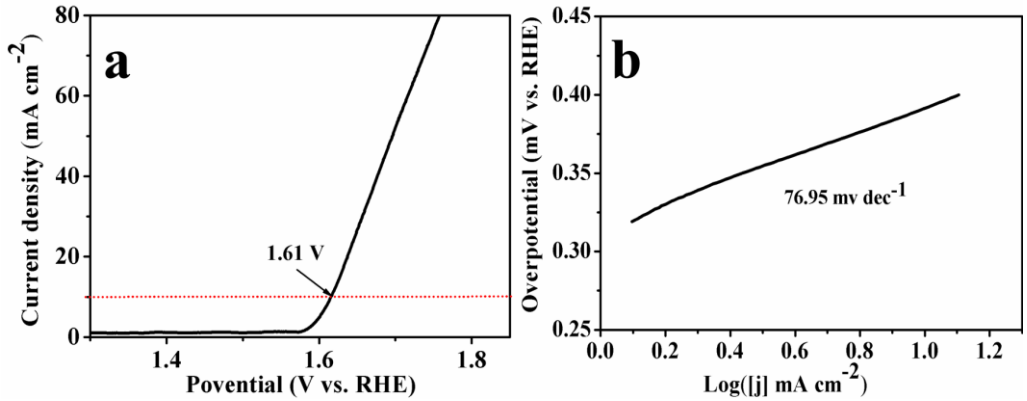

Fig. S7 The LSV polarization curve (a) and Tafel plot (b) of WO_3 with less oxygen vacancies.

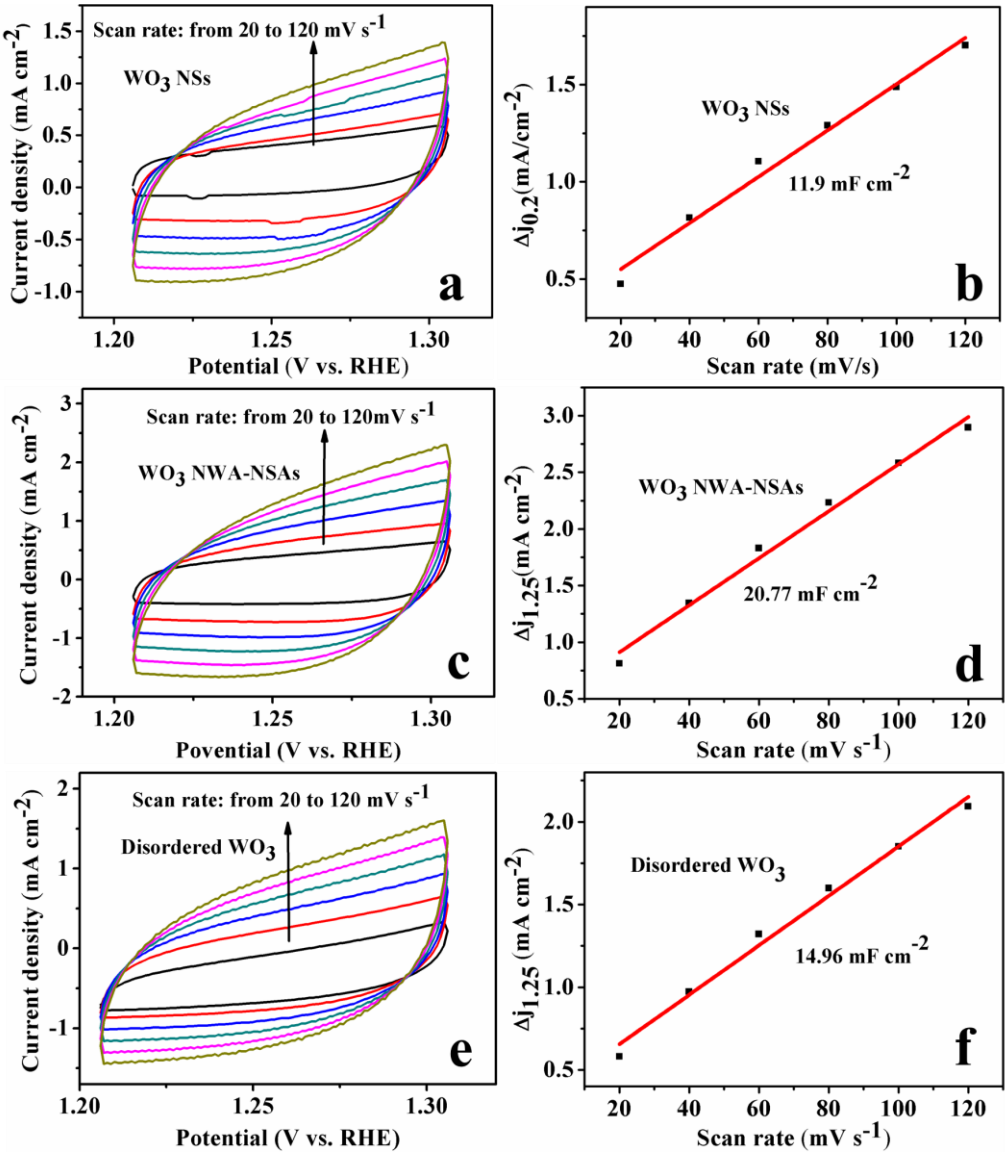

Fig. S8 The CV (a, c, e) and ECSA (b, d, f) of WO_3 NSs, WO_3 NWA-NSAs and disordered WO_3

Table S1. The comparison of WO_3 NSA-NWAs and the reported Ni foam supported OER catalysts

Materials	Mass loading on Ni foam (mg cm^{-2})	Working electrode area (cm^2)	Electrolyte	Onset potential (V vs. RHE)	Overpotential (V at 10 mA cm^{-2})	Tafel slope ($mV\ dec^{-1}$)	References
WO_3 NSA-NWAs	26	0.25	1 M KOH	0.20	0.23	33	This work
Ni_3Se_2	8.87	1	1 M KOH	~0.22	~0.24	144	S1
NiO	5	4.84	1 M KOH	0.32	0.41	109	S2
$NiSe_2$/Graphene	2.5	3	0.1 M KOH	\	~0.30	89	S3
MoS_2	25	1	1M KOH	~0.25	\	105	S4
Carbon dots/Ni_3S_2	4.2	4	1M KOH	\	0.27	67	S5
Ni_3S_2/Ni foam	2.5	8	1M KOH	0.30	\	95.4	S6
Co_3O_4−C	1.8	12	0.1M KOH	\	0.32	73	S7
Ni-Fe-O	5.4	1	1 M KOH	0.24	0.27	\	S8

Table S2. The comparison of WO_3 NSA-NWAs and the reported OER catalyst powders dipped on glassy carbon electrodes

Materials	Electrolyte	Onset potential(mV vs. RHE)	Overpotential (mV at10 mA cm^{-2}	Tafel slope ($mV \cdot dec^{-1}$)	References
WO_3 NSA-NWAs	1M KOH	200	230	30	This work
NiFe	1M KOH	200	320	113	S9
N-Co-Fe-LDH	1M KOH	240	280	57.37	S10
$SrCo_{0.4}Fe_{0.2}W_{0.4}O_{3-\delta}$	1M KOH	296	399	50	S11
Co-Fe-P	0.1M KOH	230	325	98.1	S12
NiCo@$NiCoO_2$	1M KOH	270	315	83.97	S13
IrO_2/MoO_3	0.1M NaOH	230	360	55	S14
Ni–MnO/rGO	0.1M KOH	270	370	82	S15
Fe-Ni_3C	1.0 KOH	250	275	62	S16
CoOx/Graphere	0.1M KOH	240	295	57	S17

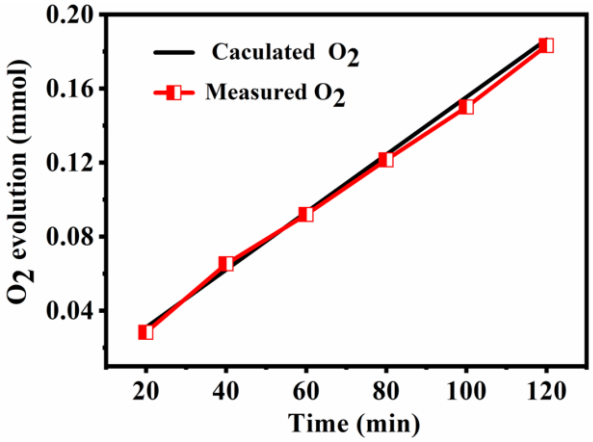

Fig. S9 the oxygen production of WO_3 NWA-NSA at the current density of 10 mA cm^{-2} for 120 min

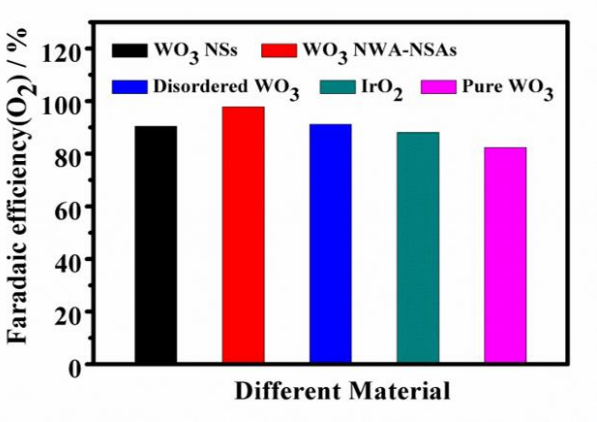

Fig. S10 FEs of WO_3 NSs, WO_3 NWA-NSAs, disordered WO_3, IrO_2 and pure WO_3 at potential of 1.55 V

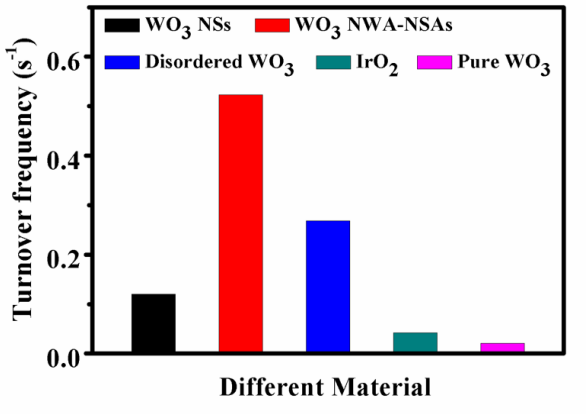

Fig. S11 TOFs of WO_3 NSs, WO_3 NWA-NSAs, disordered WO_3, IrO_2 and pure WO_3 under 1.55 V

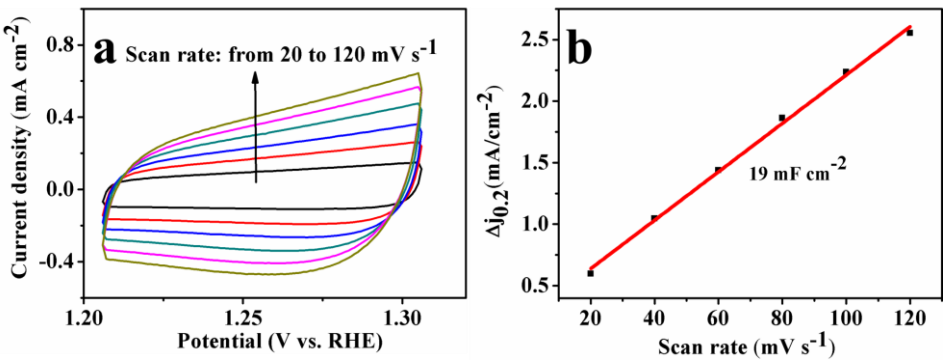

Fig. S12 ECSA of WO_3 NWA-NSA catalyst after cycling test

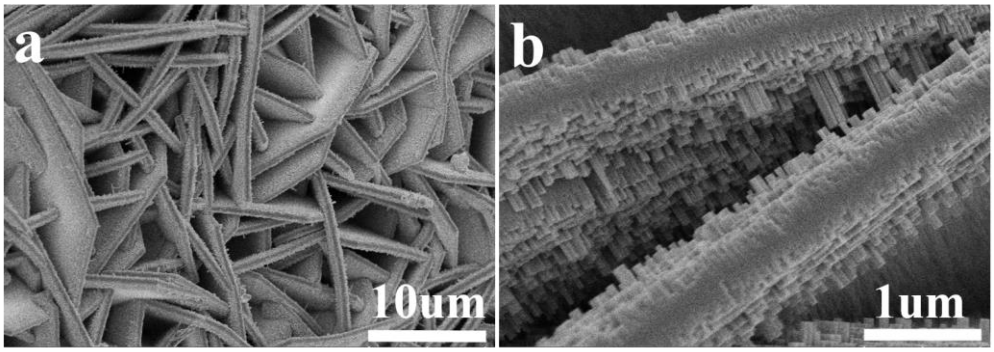

Fig. S13 SEM images of WO_3 NWA-NSA catalyst after cycling test

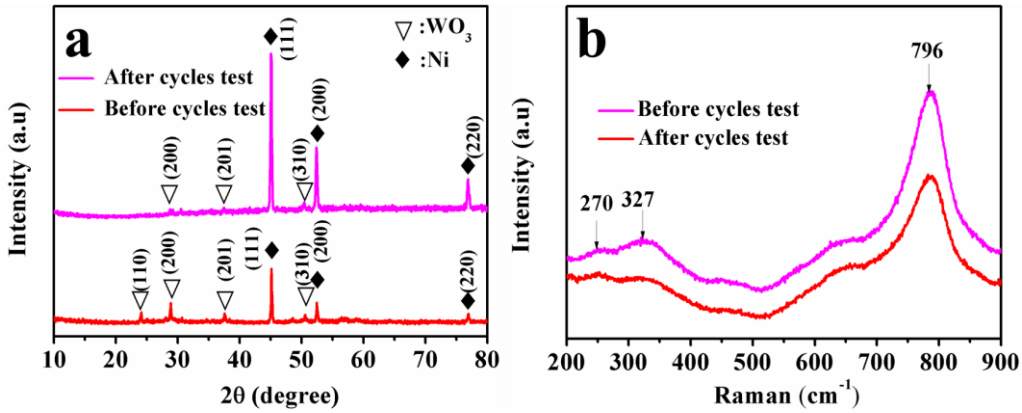

Fig. S14 XRD and Raman spectra of WO_3 NWA-NSA catalyst after cycling test

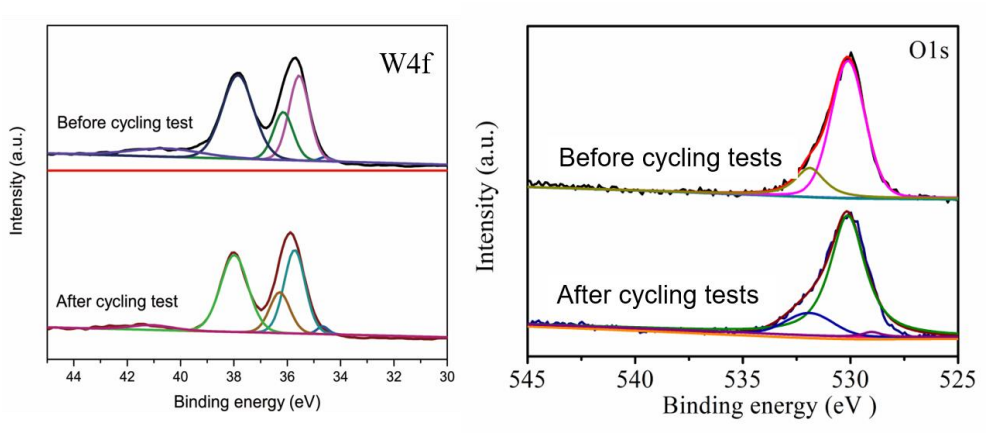

Fig. S15 XPS spectra of WO_3 NWA-NSA catalyst after cycling test

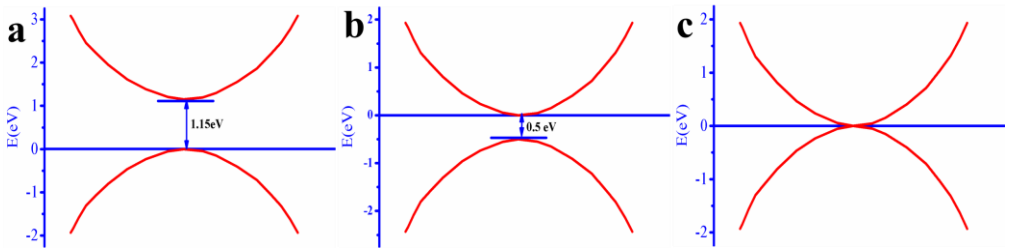

Fig. S16 the electronic band structure scheme of WO_3 (a), WOx-B (b) and WOx-S (c) on the around Γ point.

References

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