Supporting Information

CoMo-LDH ultrathin nanosheets as a highly active and bifunctional electrocatalyst for overall water splitting

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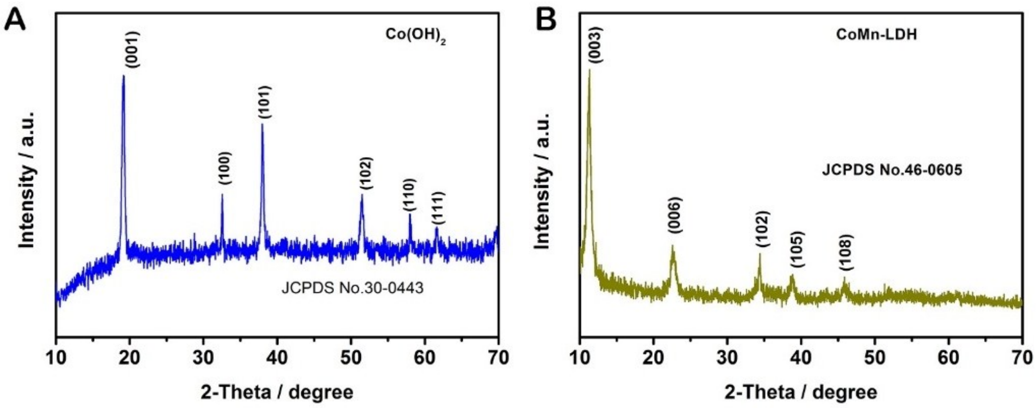


Figure S1. XRD patterns of $Co(OH)_2$ and CoMn-LDH samples.

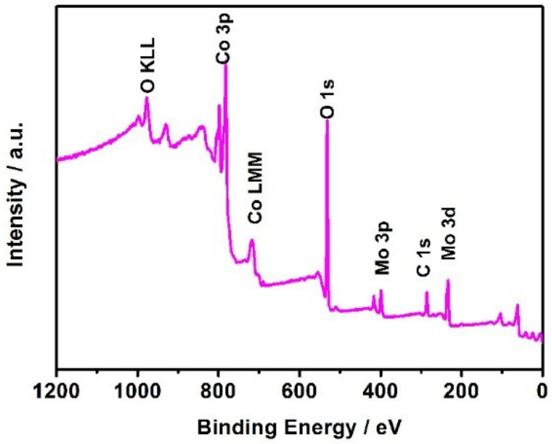


Figure S2. XPS survey spectrum of CoMo-LDH.

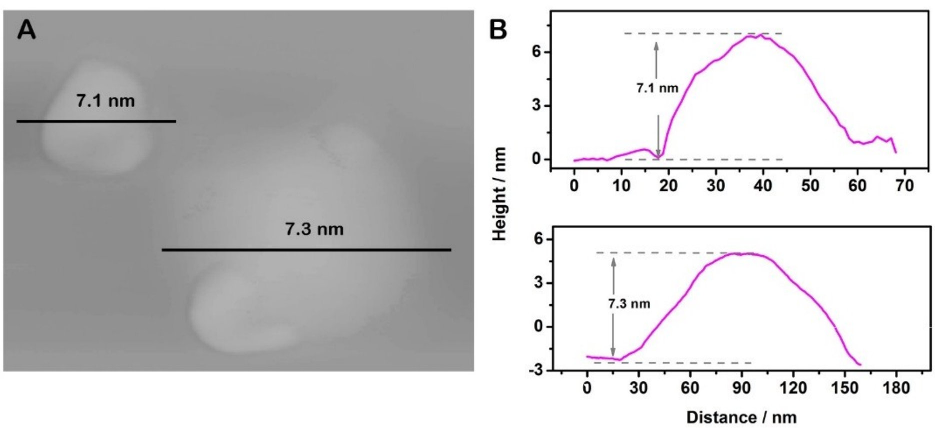
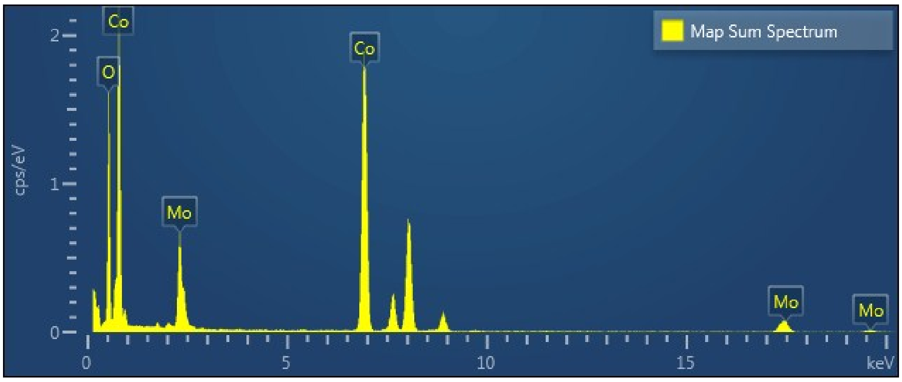


Figure S3. (A) tapping mode AFM image of the CoMo-LDH (B) the corresponding height profile of the CoMo-LDH.



Element	Line Type	k factor	Absorption Correction	Wt%	Wt% Sigma
O	K series	1.86867	1.00	24.06	0.42
Co	K series	1.26119	1.00	54.08	0.53
Mo	L series	1.73629	1.00	21.86	0.59
Total:				100.00	

Figure S4. EDX spectra of CoMo-LDH.

Sample	Element	Concentration Wt.%	Concentration At.%
CoMo-LDH	Co	22.6	38.4
	Mo	7.1	7.4

Table S1. ICP results of the CoMo-LDH

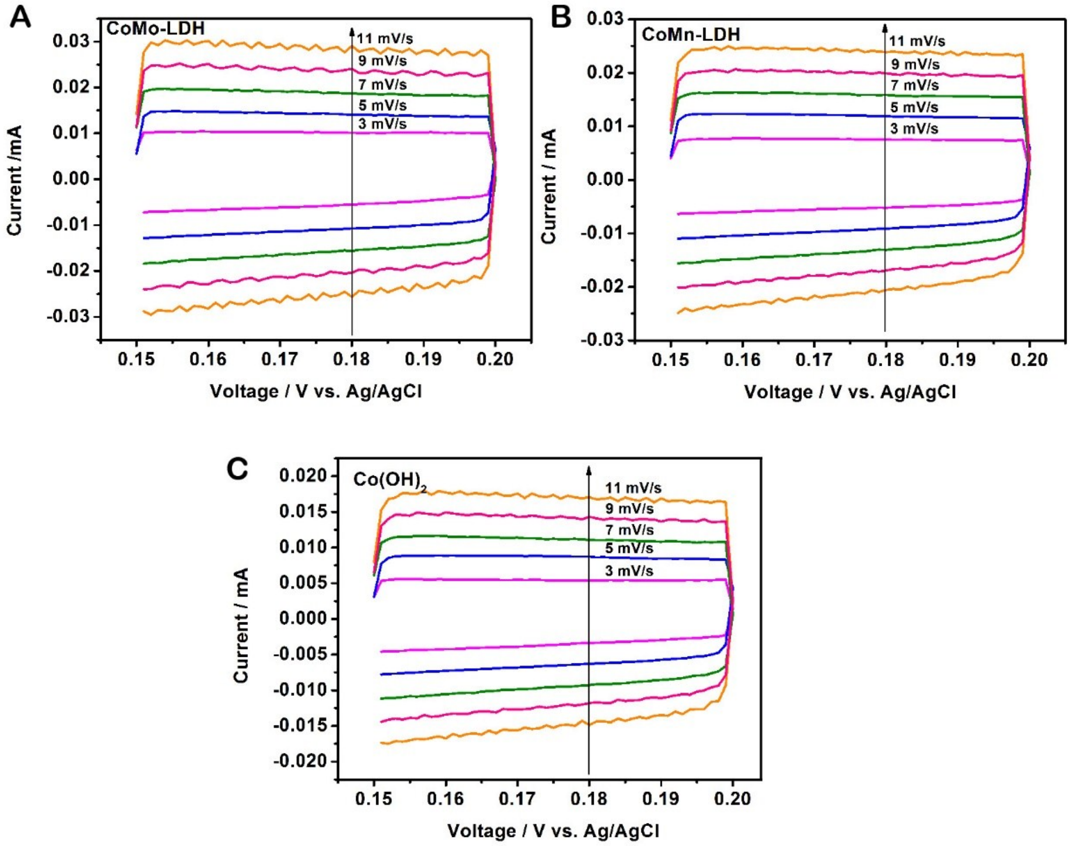


Figure S5. The CDL plots of the CoMo-LDH, CoMn-LDH and $Co(OH)_2$ samples.

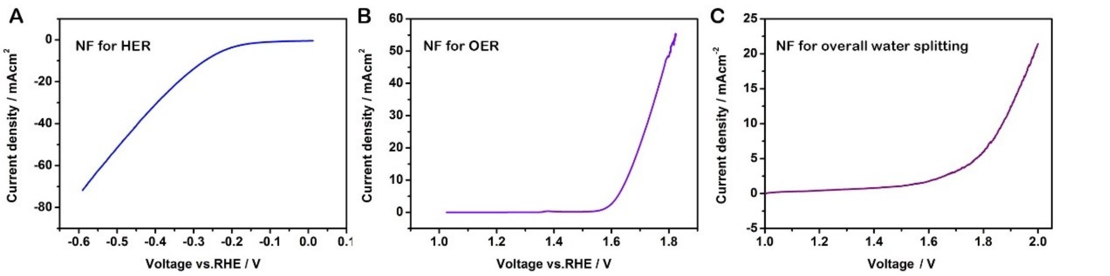


Figure S6. The LSV curves of nickel foam (NF) for the (A) HER, (B) OER and (C) overall water splitting.

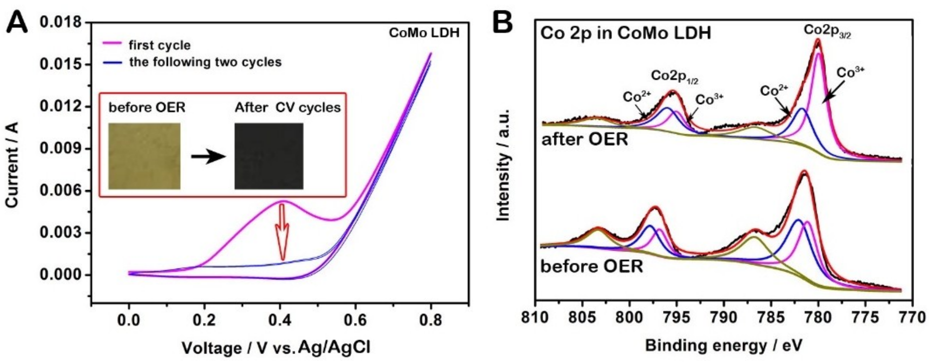


Figure S7. (A) Cyclic voltammetry (CV) curves for the CoMo-LDH deposited on ITO substrate in the OER process. Inset: Optical images of the CoMo-LDH prior to and after CV cycles. (B) The Co 2p XPS spectra for the CoMo LDH before and after the OER test.

In order to further investigate the role of the Mo^{6+}, the first three CV curves were tested and shown in Figure S7A. After the 1st cycle, the peak assigned to the oxidation of Co^{2+} to Co^{3+} reduced indicating that the catalyst becomes irreversibly oxidized to a higher oxidation state of Co^{3+}. Furthermore, XPS data for CoMo-LDH before and after electrocatalysis were collected. As illustrated in Figure S7B, the XPS spectrum shows an obvious increase in intensity for the Co^{3+} and the decrease for the Co^{2+} after OER, thus confirming the oxidation of Co^{2+} to Co^{3+}. Benefiting from the prominent ability to draw electrons of high-valence Mo^{6+}, the Co would easily stay as their high-valence state, which is widely regarded as active sites for OER.

Table S2. Comparision of the OER performance with various reported materials loaded on the glassy carbon.

Material	Overpotential (mV) /10 mA cm^{-2}	Tafel slope mV / decade	Ref.
CoMo LDH	300	56	This work
NiCo LDH	330	42	1
NiFe LDH	300	40	1
NiCoP	300	80	2
CoVOx	347	49	3
CoFe LDH	340	85	5
NiV LDH	310	50	4
$NiCo_2O_4$	320	32	5
$CoMoO_4$	312	56	6
NiFe LDH/CR	256	50	7
NiFe LDH/ CF	260	55	8

Table S3. Comparision of the overall water splitting performance with various reported materials loaded on the nickel foam.

Material	Voltage / V @ 10 mA cm^{-2}	Electrolyte	Ref.
CoMo LDH	1.63	1 M KOH	This work
VOOH	1.62	1 M KOH	9
NiSe	1.63	1 M KOH	10
$NiCo_2O_4$	1.65	1 M KOH	11
NiFe/$NiCo_2O_4$/NF	1.67	1 M KOH	12
NiFe LDH	1.7	1M NaOH	1

References

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