Modulated Transition Metal-Oxygen Covalency in Octahedral Sites of CoFe Layered Double Hydroxides with Vanadium Doping Leading to Highly Efficient Electrocatalyst

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Notes

The authors declare no competing financial interest.

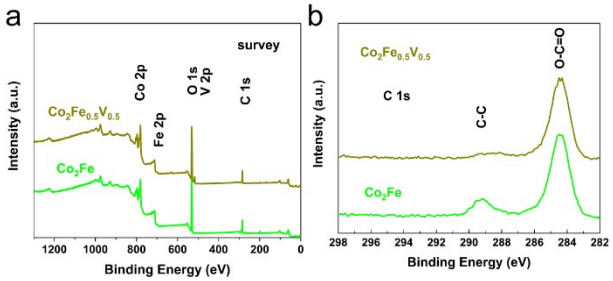

Figure S1 a) XPS survey of Co_2Fe and $Co_2Fe_{0.5}V_{0.5}$; b) High-resolution XPS C 1s spectrum of Co_2Fe and $Co_2Fe_{0.5}V_{0.5}$.

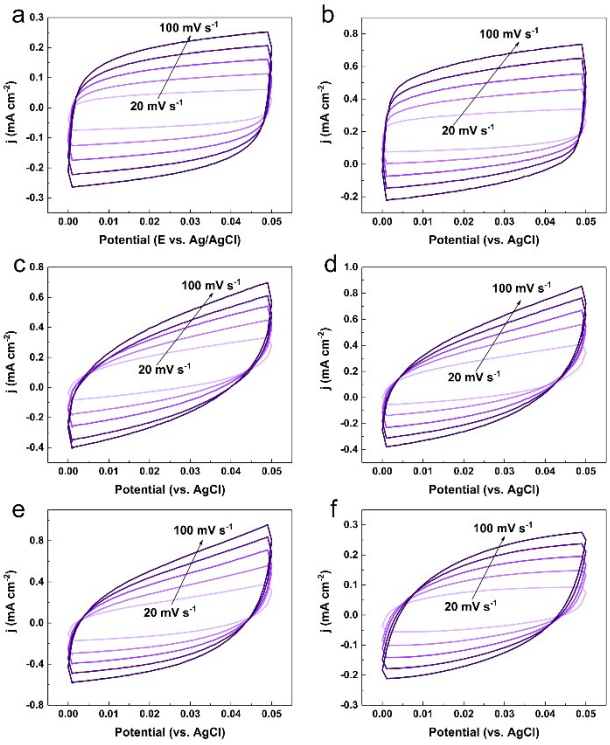

Figure S2 a-e) CV curves at various scan rate of $Co_2Fe_{0.5}$@CP, Co_2Fe@CP, $Co_2Fe_{0.67}V_{0.33}$@CP, $Co_2Fe_{0.5}V_{0.5}$@CP and, $Co_2Fe_{0.33}V_{0.67}$@CP and Co_2V@CP, respectively.

Table S1 The fitting of electrochemical parameter

Samples	Tafel slope	C_{dl}	EIS		
	R^2	R^2	CPE-T	CPE-P	Chi-Squared
$Co_2Fe_{0.5}$	0.99	0.98	0.036	0.705	0.0039
Co_2Fe	0.99	0.99	0.105	0.723	0.0011
$Co_2Fe_{0.67}V_{0.33}$	0.99	0.98	0.099	0.814	0.0004

$Co_2Fe0_{.5}V_{0.5}$	0.97	0.99	0.143	0.556	0.0003
$Co_2Fe_{0.33}V_{0.67}$	0.95	0.99	0.04	0.833	0.0006
Co_2V	0.96	0.99	0.013	0.885	0.003

Table S2 The fitting of EIS parameter

	Rs (Ω)	Rct (Ω)
$Co_2Fe_{0.5}$	2.49	7.83
Co_2Fe	1.62	3.30
$Co_2Fe_{0.67}V_{0.33}$	1.48	1.95
$Co_2Fe0_{.5}V_{0.5}$	1.43	0.58

$Co_2Fe_{0.33}V_{0.67}$	1.71	0.94
Co_2V	1.69	6.56

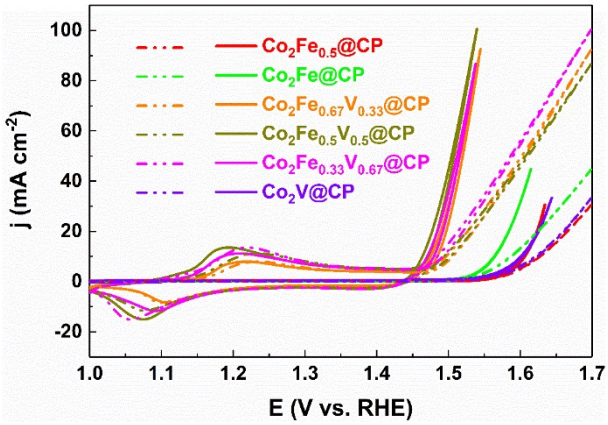

Figure S3 Original and IR-corrected CV polarization curves.

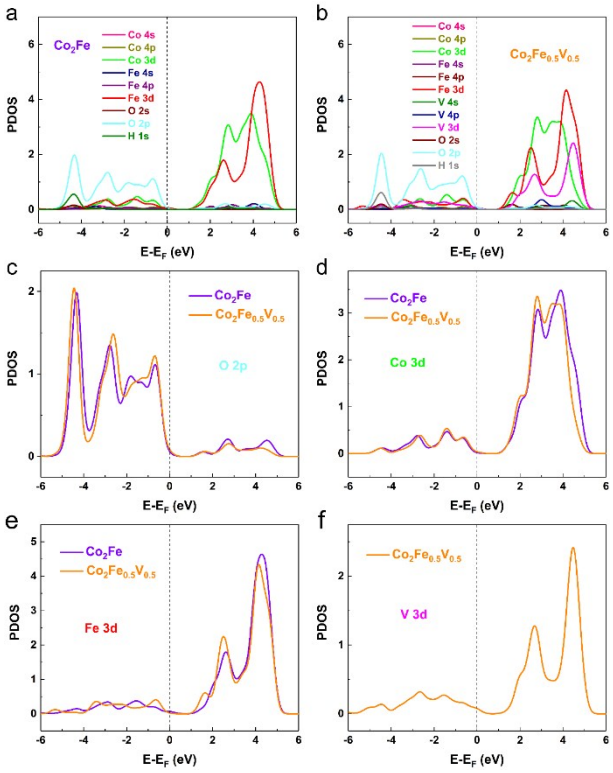

Figure S4 a) and b) TDOS of Co_2Fe and $Co_2Fe_{0.5}V_{0.5}$, respectively. c)-e) PDOS of O 2p, Co 3d and Fe 3d in Co_2Fe and $Co_2Fe_{0.5}V_{0.5}$, respectively. f) PDOS of V 3d in $Co_2Fe_{0.5}V_{0.5}$.

Table S3 Comparison of catalytic performance of $Co_2Fe_{0.5}V_{0.5}$ LDH to recently reported high performance metal oxide/hydroxide OER catalysts.

Electrocatalysts	electrolyte	j (mA cm^{-2})	η (mV)	Tafel slope (mV dec^{-1})	Ref.
$Co_2Fe_{0.5}V_{0.5}$ LDH@CP	1.0 M KOH	10	242	40	This work

CoFeMo (oxy)hydroxides/GC	1.0 M KOH	10	277	28	[1]
Fe-doped $Co_3V_2O_8$/GC	1.0 M KOH	10	307	36	[2]
$Nix Co_{3-x}O_4$ nanowires/NF	1.0 M KOH	10	337	75	[3]
Co3Fe1.5-LDH/NF	1.0 M KOH	10	284	45	[4]
CoFe-Bi@CoFe-LDH NA/TM	0.1 M KOH	10	418	108	[5]
CoFe-LDH/rGO	0.1 M KOH	10	325	-	[6]
$Fe_{0.33}Co_{0.67}$OOH PNSAs/CFC	0.1 M KOH	10	266	30	[7]
$CuCo_2O_4$/NrGO	1.0 M KOH	10	360	64	[8]
PA-CoS_x(OH)y/NF	1.0 M KOH	10	261	-	[9]
Co/CoP–NC	1.0 KOH	10	300	44	[10]
$LiCoO_x$/CP	0.1 M KOH	10	290	50	[11]
NiCo oxides/NF	0.1 M KOH	10	370	-	[12]
$FeCo_{1-x}$ONS/GC	0.1 M KOH	10	308	36.8	[13]
Co_3S_4/NCNTs	0.1 M KOH	10	430	70	[14]

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