A Novel Cyclized Polyacrylonitrile Binder Strategy for Efficient Oxygen Evolution Reaction Catalysts

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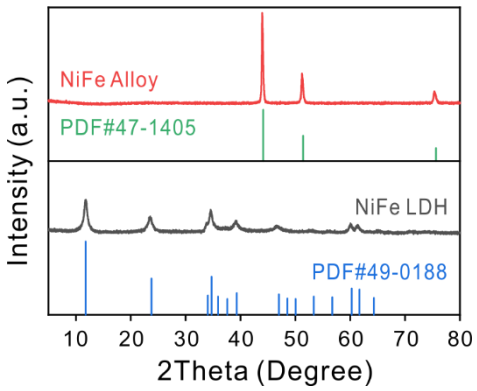


Figure S1. XRD patterns of NiFe LDH and NiFe Alloy.

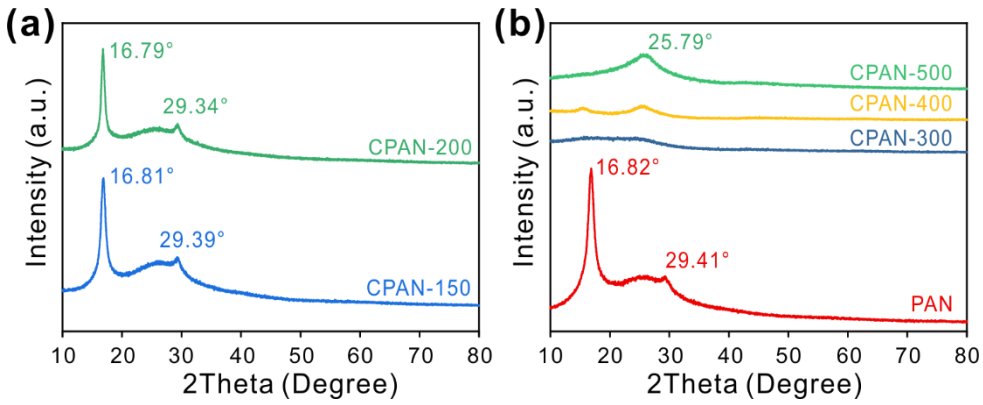


Figure S2. XRD patterns of (a) CPAN-150, CPAN-200, and (b) PAN, CPAN-300, CPAN-400, and CPAN-500.

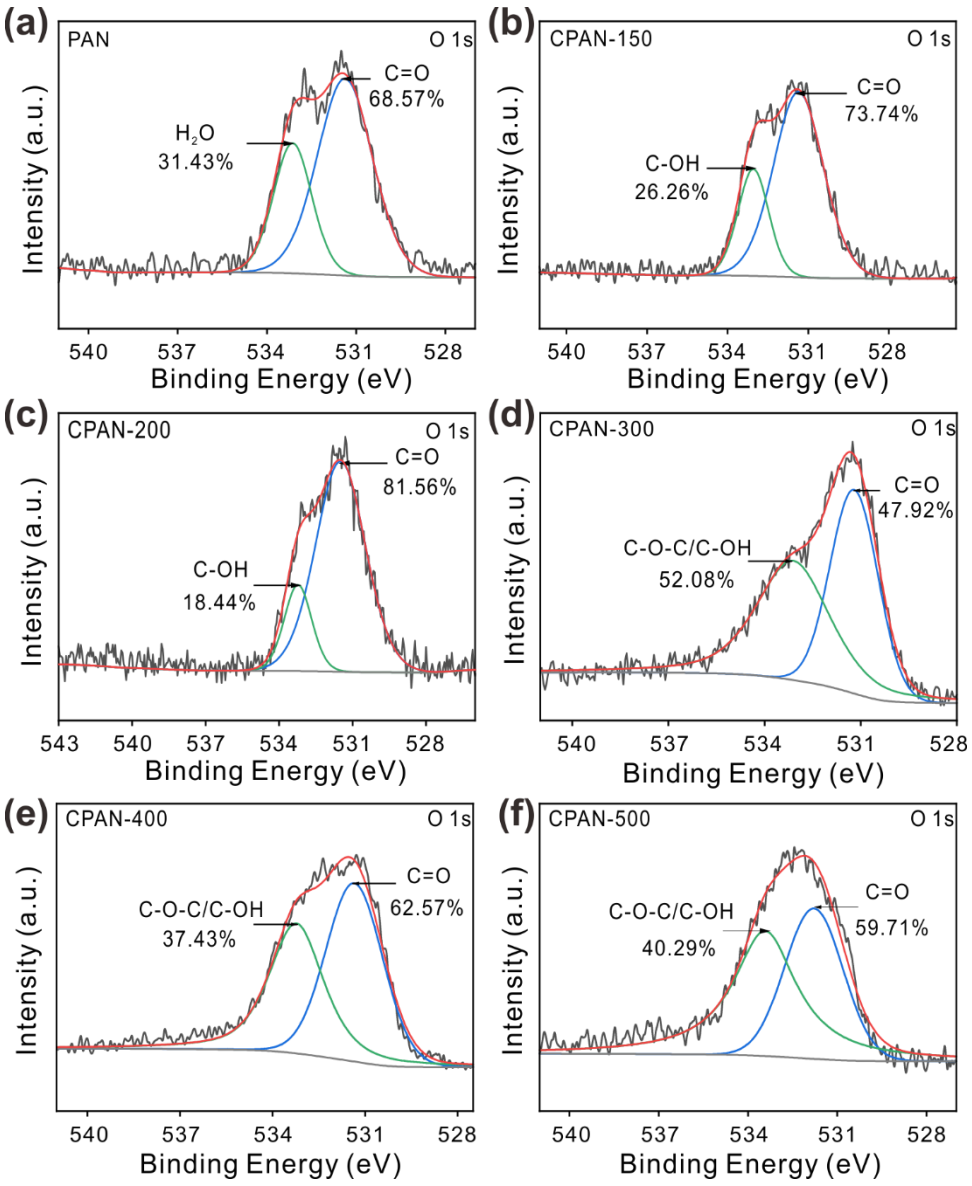


Figure S3. High resolution XPS spectra of O 1s (a) PAN, (b) CPAN-150, (c) CPAN-200, (d) CPAN-300, (e) CPAN-400, and (f) CPAN-500.

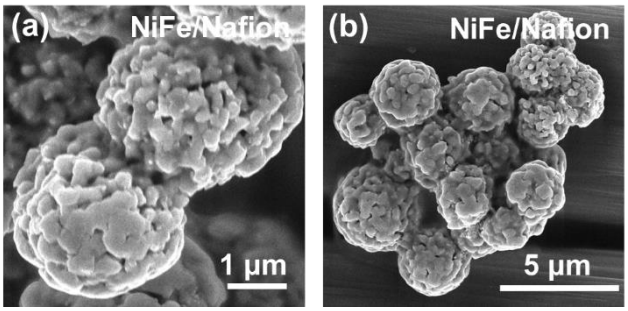


Figure S4. SEM images of the synthesized Nafion based electrodes.

Table S1. All the electrochemical parameters of the prepared composite electrodes

	NiFe/ Nafion	NiFe /PAN	NiFe/ CPAN-150	NiFe/ CPAN-200	NiFe/ CPAN-300	NiFe/ CPAN-400	NiFe/ CPAN-500
R_{ct} (Ω)	1.16	2.30	1.34	0.74	0.55	0.34	0.59
R_s (Ω)	2.40	2.22	2.26	2.26	2.15	2.13	2.13
C_{dl} (mF cm^{-2})	2.62	1.29	1.51	1.46	1.75	4.15	1.48
ECSA	66.75	35.5	41.1	39.1	46.2	106.15	38.4
Overpotntial (mV) at 10 mA cm^{-2}	326	318	307	299	319	280	284
Overpotntial (mV) at 50 mA cm^{-2}	424	394	363	363	378	337	326
Overpotntial (mV) at 100 mA cm^{-2}	507	457	397	390	423	354	376
Tafel slope (mV dec^{-1})	96.6	86.7	71.8	69.3	66.8	59.9	59.5

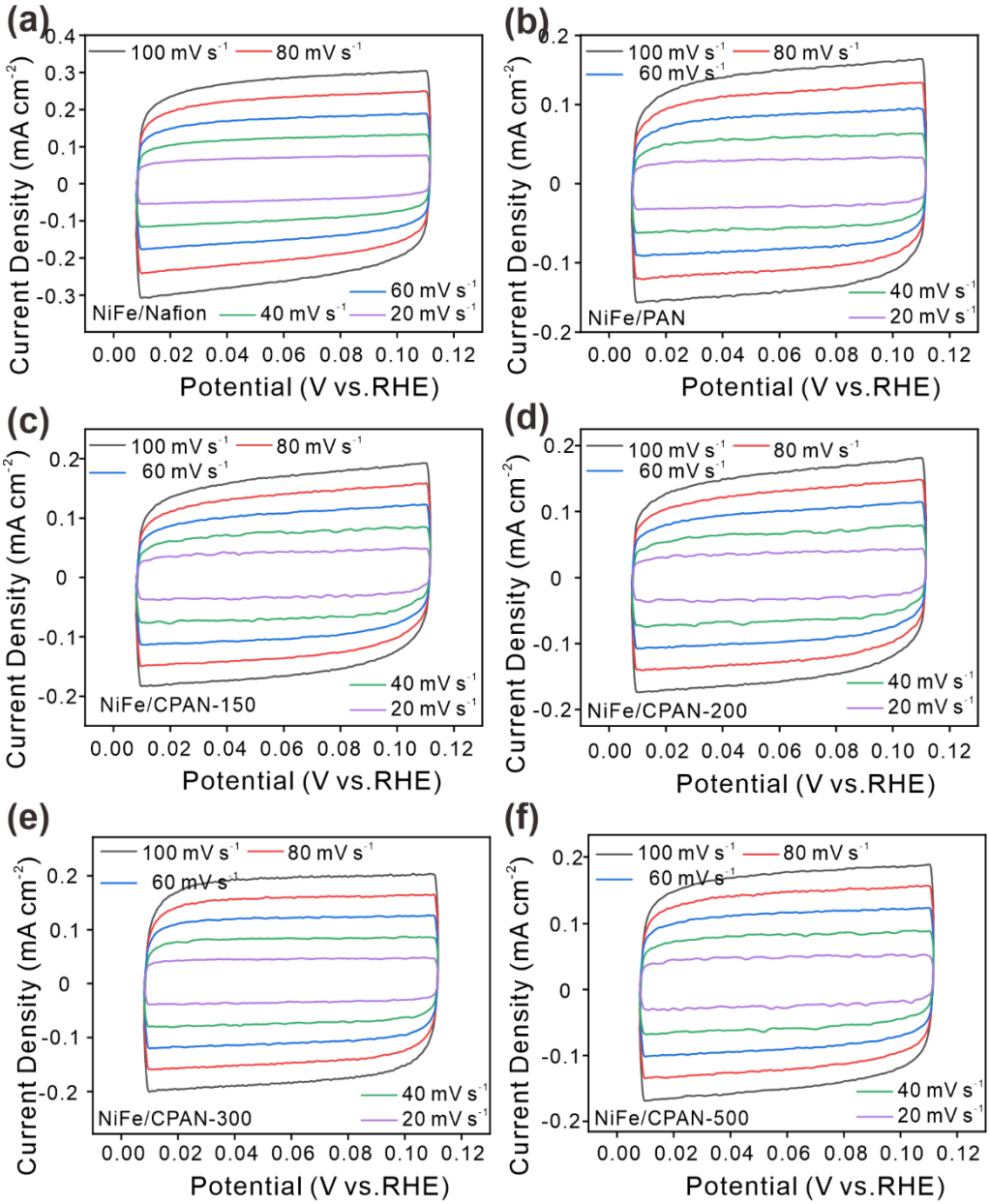


Figure S5. CV curves under various scan rates (scan rates: 20 to 100 mV s^{-1}) of the synthesized electrode materials: (a) NiFe/Nafion, (b) NiFe/PAN, (c) NiFe/CPAN-150, (d) NiFe/CPAN-200, (e) NiFe/CPAN-300, and (f) NiFe/CPAN-500.

Table S2. Comparison of overpotentials for OER catalysts in the literature and in this work.

Catalysts	Overpotential (mV)	Current densities (mA cm^{-2})	Ref
NiFe (hydr) oxides	346	10	(1)
NiFe/W0.3C@NC	290	10	(2)
NiFe films	290	10	(3)
NiFe/CPAN-400	280	10	This work
	337	50	
	354	100	
NiFe/CNTs-900	257	10	(4)
Exfoliated NiFe LDH/CB nanosheets	220	10	(5)
NiFe HOF	250	50	(6)
$Ni_{78}Fe_{22}$	222	10	(7)
	286	1000	
	327	2000	
FcNiOF	280	1000	(8)
	284	2000	

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