Supporting Information

Heterostructure Design of 2D BCN-MoS_2 Nanocomposite for Efficient Seawater Electrolytic Hydrogen Evolution

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Discuusion S1

The nucleophilic attack of OH^- ions to Boron atom leads to hydrolysis between B-N bonds, due to this chemical degaradtion boron dissolves in highly concentrated alkaline media, also etches the lattice structure. [1]

Table S1: R_s and R_{ct} values in different electrolytes.

Medium	Electrocatalyst	Rs (Ω)	Rct (Ω)
Acidic	BMO	1.07	16.653
	BCN	1.56	21.67
	MO	14.56	163.09
Alkaline	BMO	4.11	777.64
	MO	4.83	298.27
Seawater	BMO	8,18	175.3
	BCN	13.46	260
	MO	1.57 kΩ	1.26 kΩ

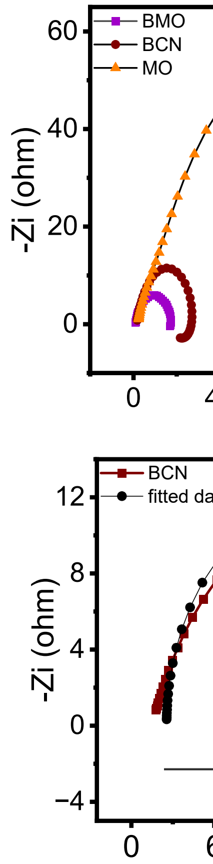


Figure S1. (a) EIS of BMO, BCN, MO, (b-d) EIS with electrical circuit.

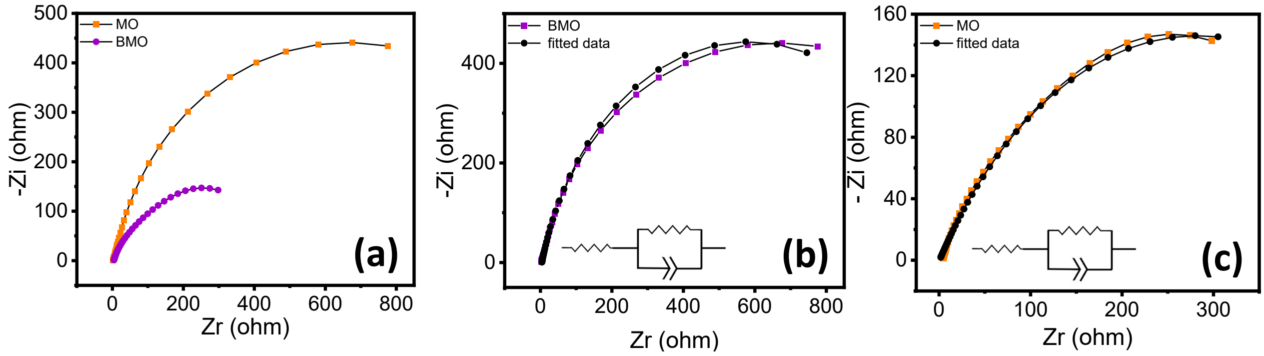
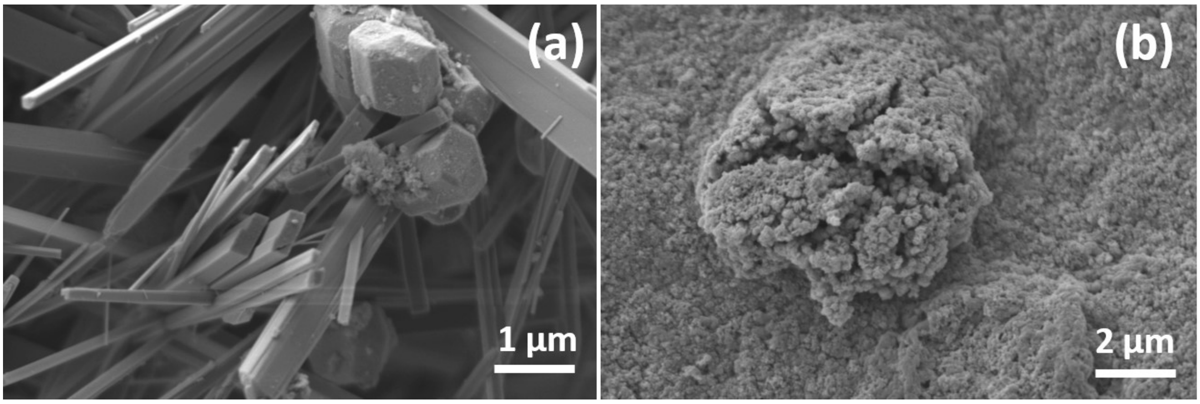


Figure S2. (a) EIS of BMO, MO, (b and c) EIS with electrical circuit.



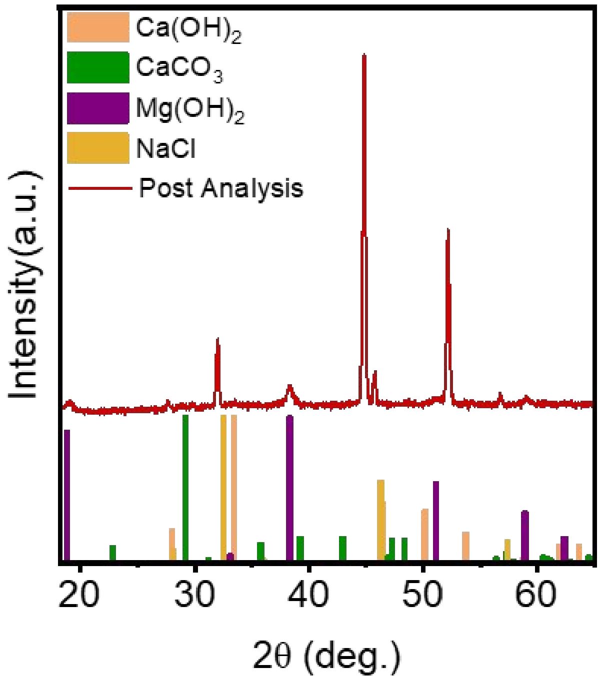


Figure S3. PXRD Post-analysis of BMO in Seawater

Figure S4. Post-SEM analysis of (a)BMO and (b) BCN in Acidic Media.

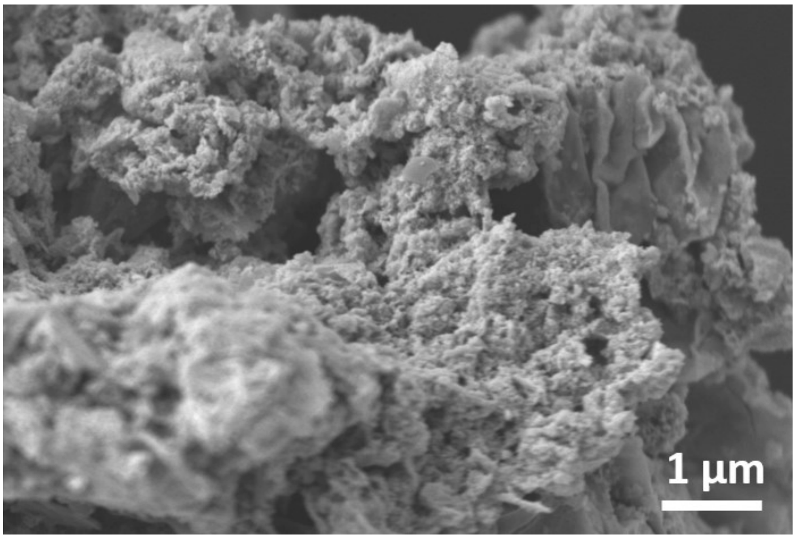


Figure S5. Post-SEM analysis of BMO in Alkaline Media.

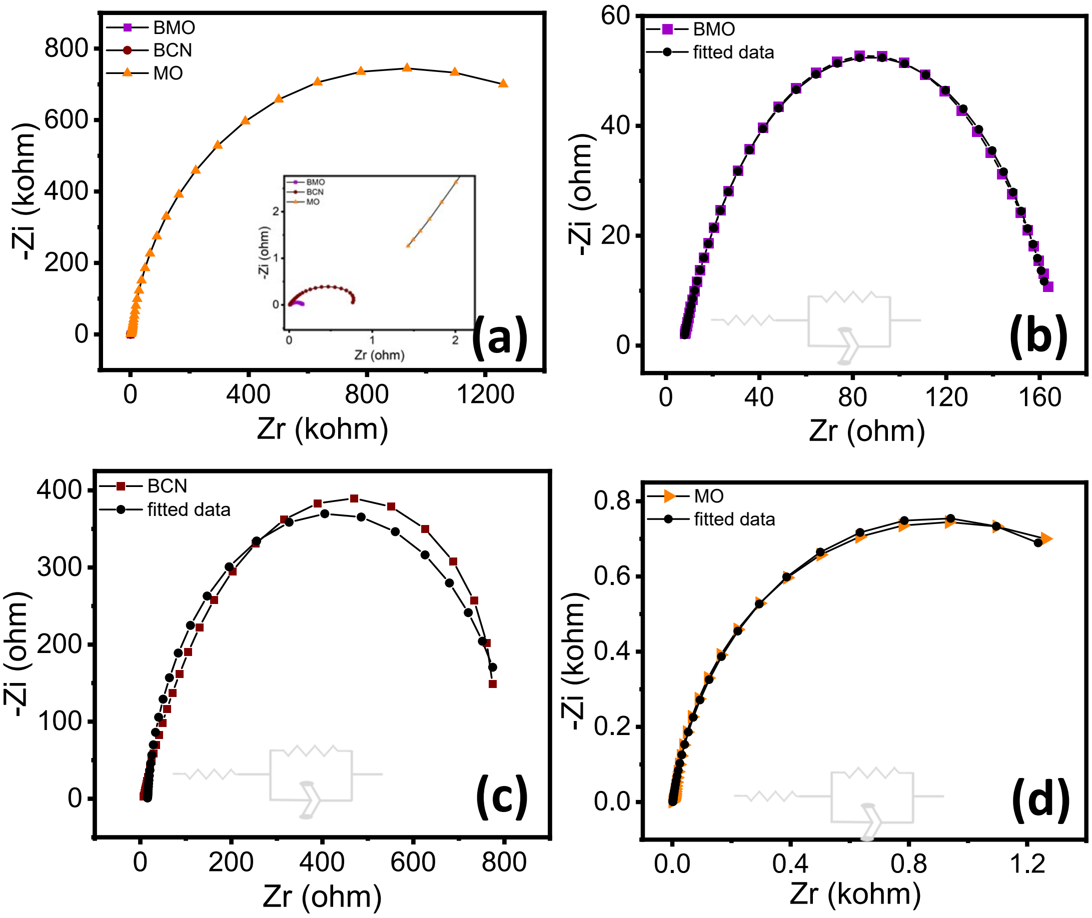


Figure S6. (a) EIS of BMO, BCN, MO, (b-d) EIS with electrical circuit.

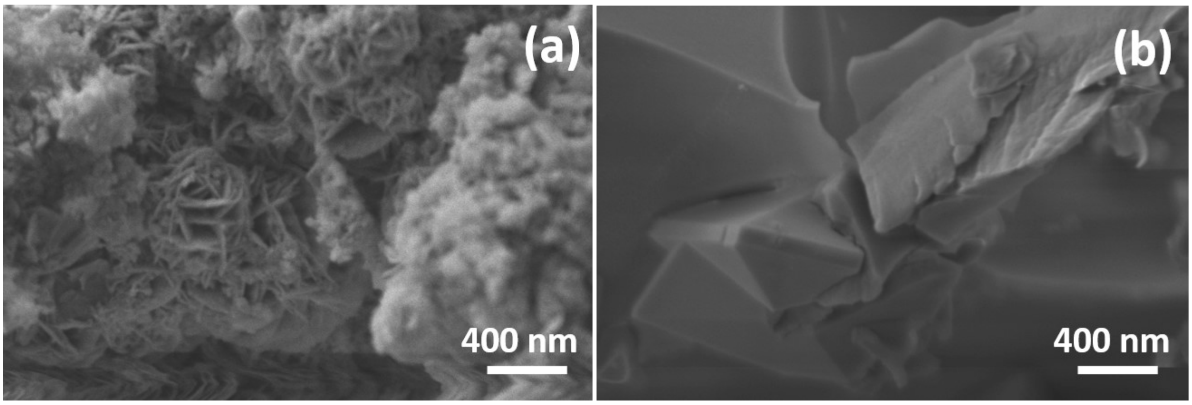


Figure S7. Post-SEM analysis of (a)BMO and (b) BCN in Seawater.

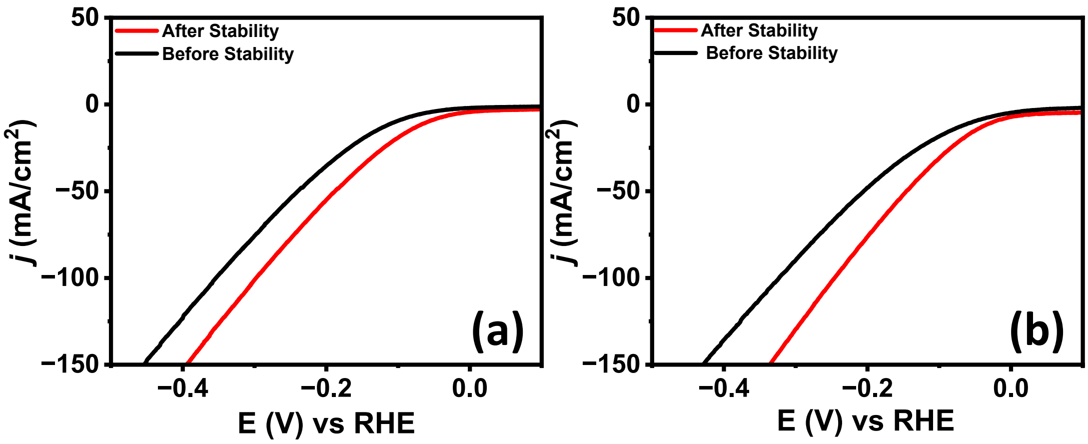


Figure S8. Before and after stability LSV curves for BMO in (a) KOH in seawater, (b) 1M KOH + 0.5M NaCl.

Table S2: Comparison table of electrochemical activity for suitable electrocatalyst.

SL.NO	Electrocatalyst	HER			Reference
		η (mV) @10 mA/cm^2	Tafel slope mV/dec	Electrolyte	
1	BCN-MoS_2 (BMO)	87	80	0.5 M H_2SO_4	This work
2	BCN-MoS_2 (BMO)	252	103	1 M KOH	
3	BCN-MoS_2 (BMO)	579	148	Natural seawater	
4	30 % Pd/B-CNPs (PEM electrolyzer)	2.04 V @ 1 A/cm^2	-	0.5 M H_2SO_4	[2]
5	BCN@GCs	333	-	0.5 M H_2SO_4	[3]
6	BN:MO_2 C@BCN	94	62	1 M KOH	[4]
7	hBN_Au_Pt (5%)	136	34.4	0.5 M H_2SO_4	[5]
8	MoS_2	214	110	0.5 M H_2SO_4	[6]
9	MoS_2 /NiO/MWCNT	550 @ 0.77 mA/cm^2	220	0.5 M H_2SO_4	[7]
10	Pt/MoS_2/SSM	67	42.7	0.5 M H_2SO_4	[8]
11	MoS_2 /Ti N 1-4	113	78	0.5 M H_2SO_4	[9]
12	MoS_2 nanomesh	160	46	0.5 M H_2SO_4	[10]
13	MoS_2SO3H	302, 346	68, 72	0.1 M H_2SO_4 and 0.1 M KOH	[11]
14	Pt/BCN	26	24	0.5 M H_2SO_4	[12]

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