Supporting Information

Iron Impregnated Cellulosic Carbon as an Effective Electrocatalyst for Seawater Oxidation

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Figures.

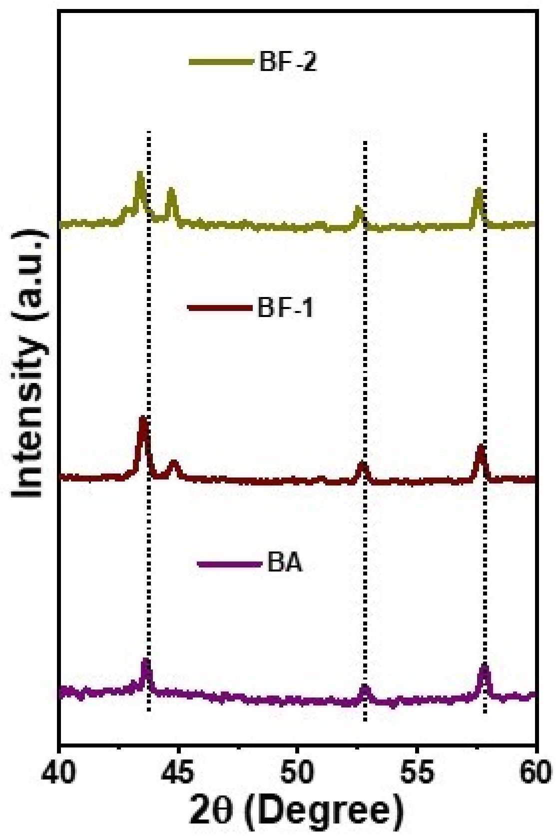

Fig S1. Magnified view of XRD pattern of all developed BA and BF samples.

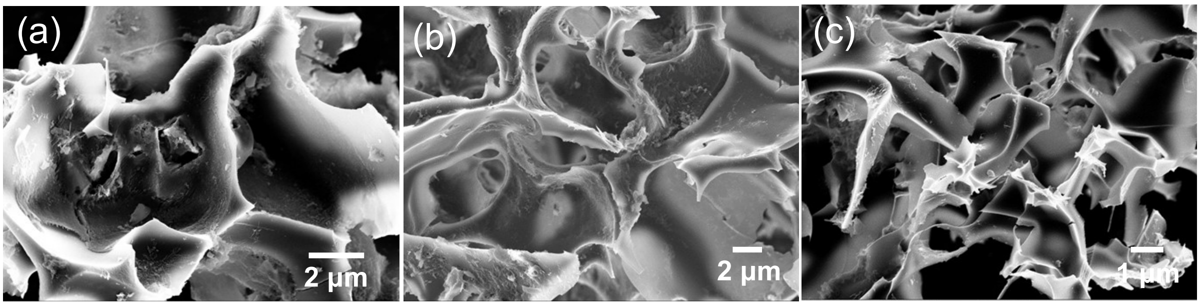

Fig S2. FESEM image of (a) BA, (b) BF-1 and (c) BF-2 samples.

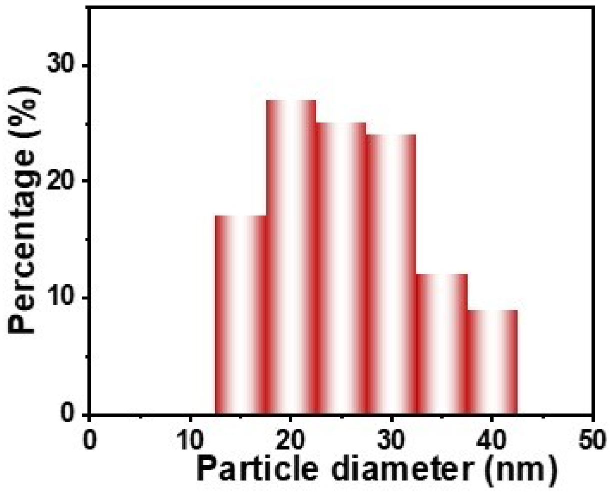

Fig S3. Statistical particle size distribution of Fe nanoparticle for BF-1 sample.

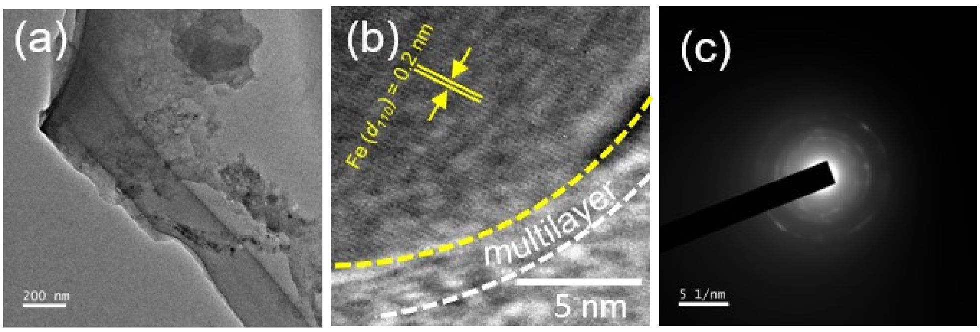

Fig S4. (a) TEM, (b) HRTEM and (c) corresponding SAED pattern of BF-2 sample.

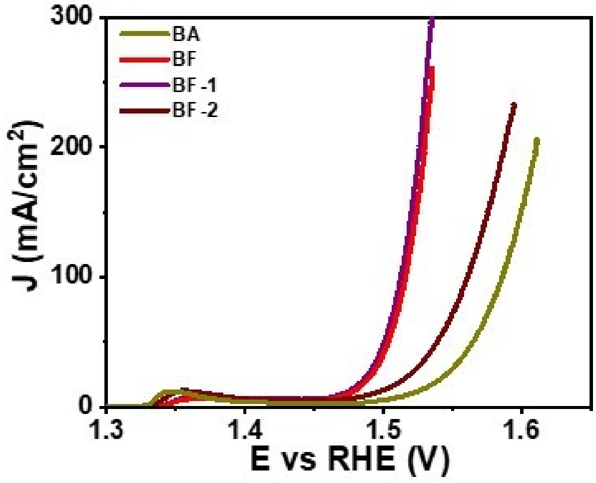

Fig S5. LSV plot of all developed samples in 1 M KOH electrolyte solution.

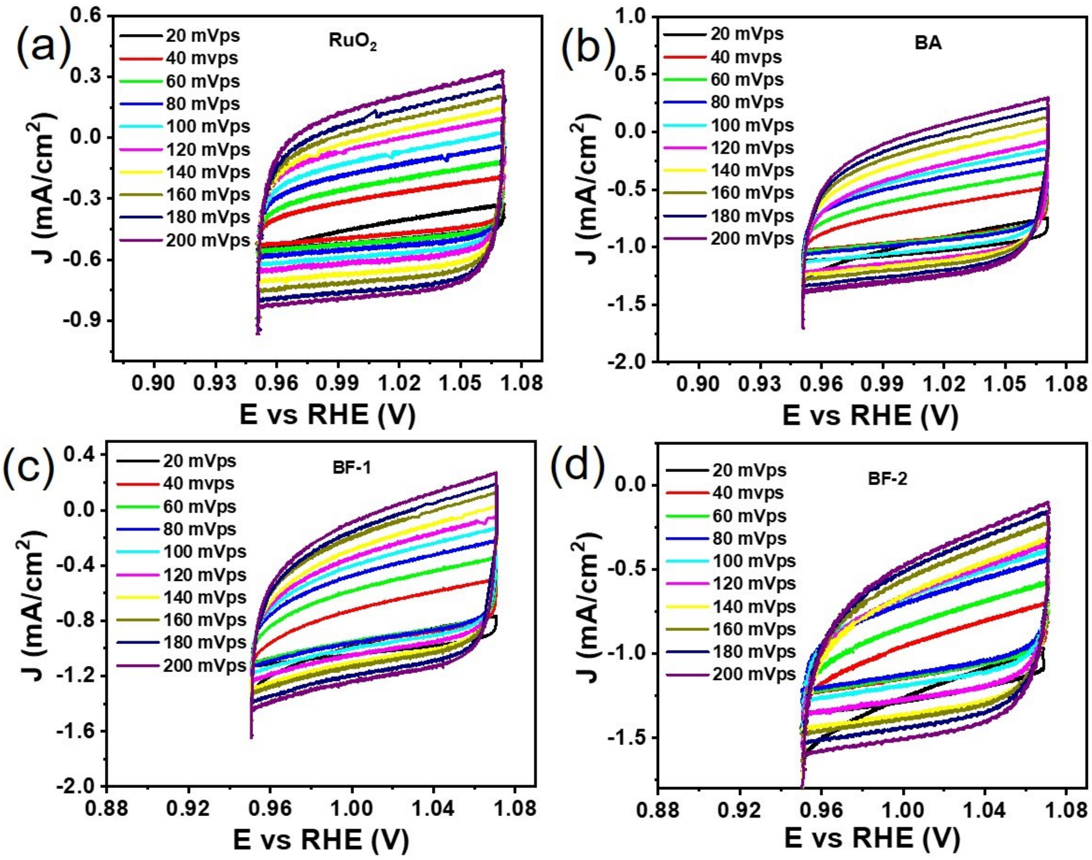

Fig S6. (a-d) Cyclic voltammograms (CV) plots recorded at various scan rate in non-faradaic region for (a) conventional RuO_2, (b) BA, (c) BF-1 and (d) BF-2 samples towards OER process in alkaline media.

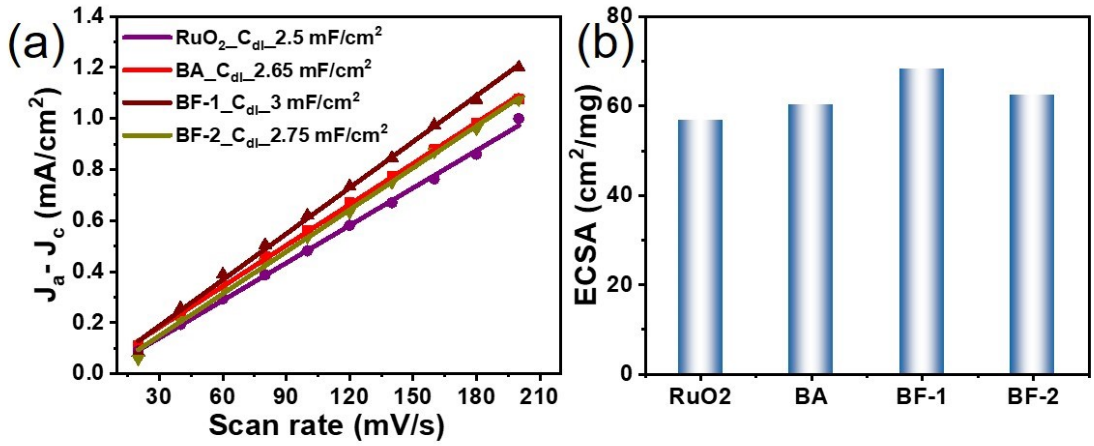

Fig S7. (a) Current density plot against scan rate to determine double layer capacitance (C_{dl}) value and (b) bar diagram representing ECSA determined for samples towards OER process in alkaline media.

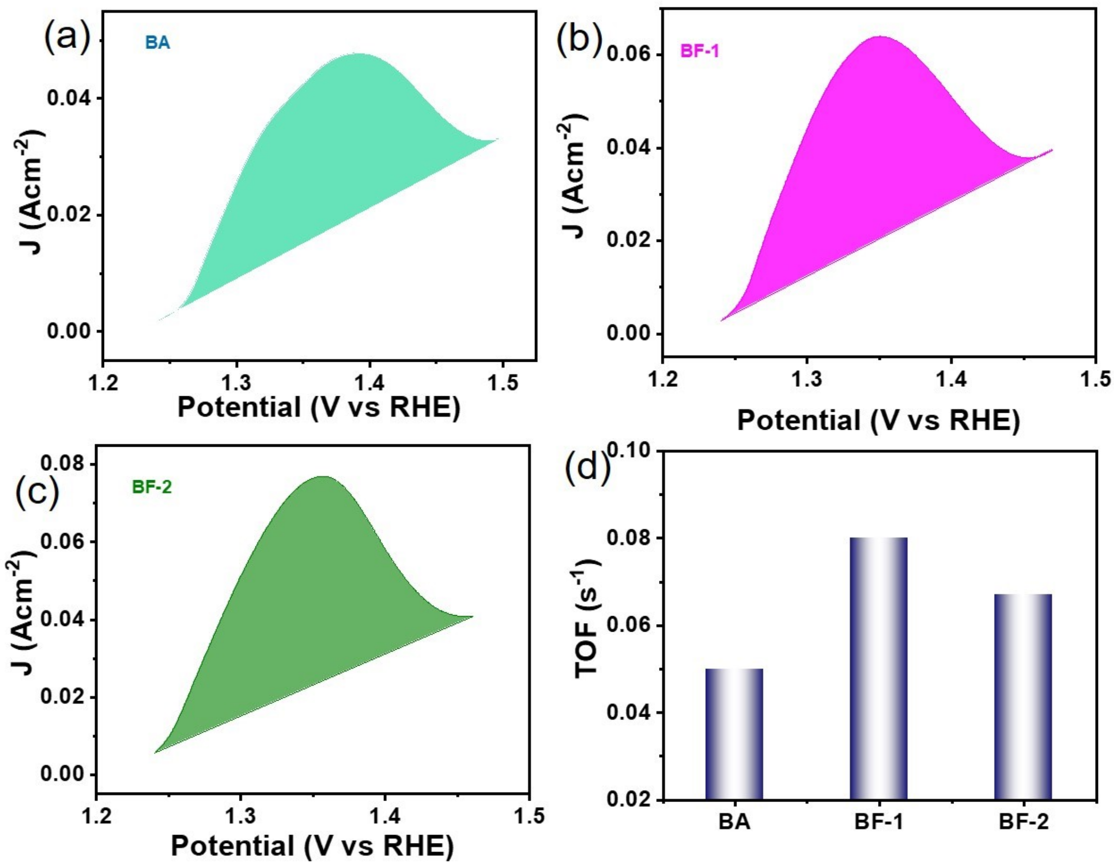

Fig S8. (a-c) Oxidation peak area of CV curves at 20 mV s^{-1} scan rate for (a) BA, (b) BF-1 and (c) BF-2 samples for OER process. (d) Bar diagram of turn over frequency (TOF) value of all developed samples for OER process at 320 mV overpotential.

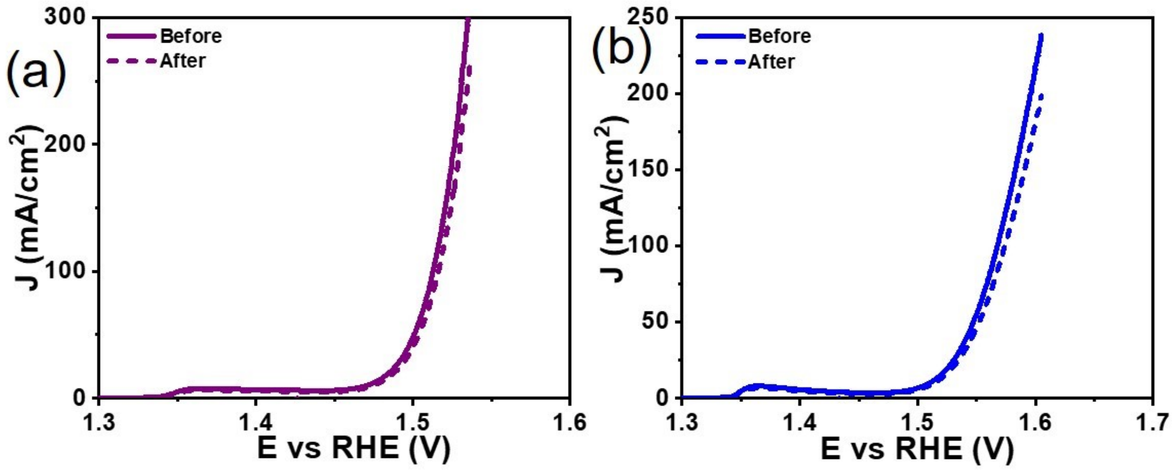

Fig S9. LSV plots of optimum BF-1 electrocatalyst before and after chronoamperometry operation towards electrochemical OER performance in (a) 1 M KOH and (b) 1 M KOH + seawater electrolytes.

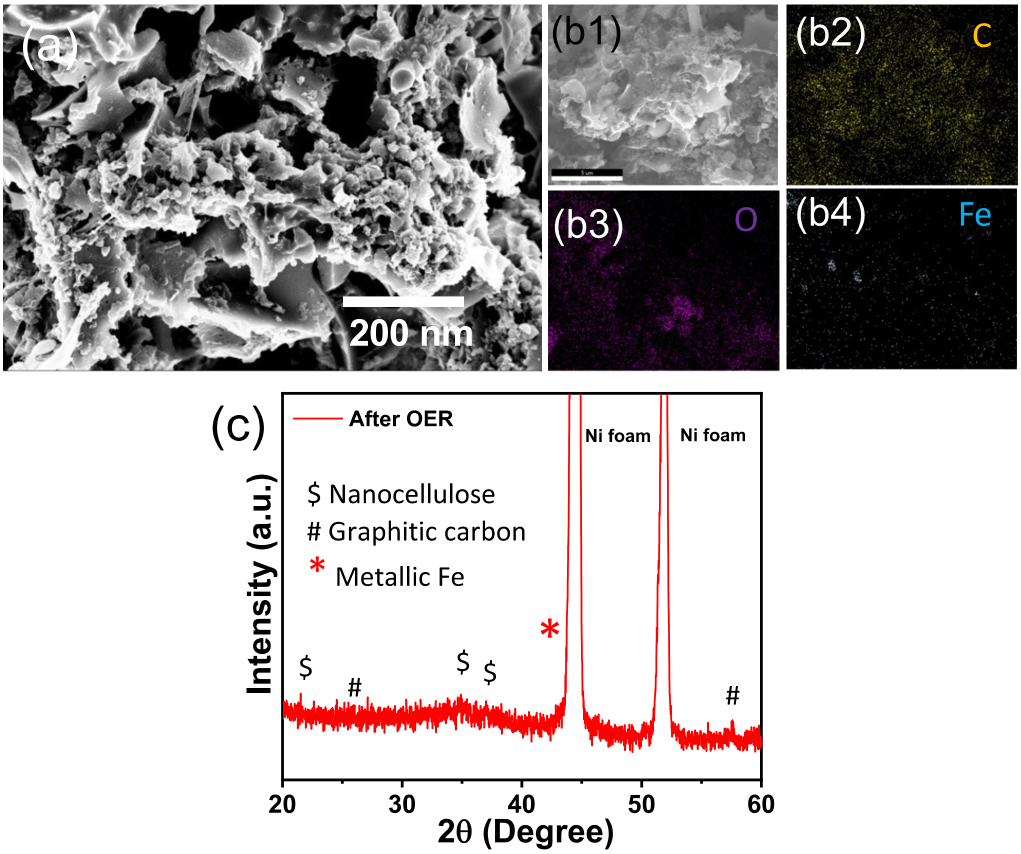

Fig S10. (a) FESEM image and (b1-b4) corresponding elemental mapping of BF-1 after stability test in alkaline seawater electrolyte. (c) XRD pattern of BF-1after stability test in alkaline seawater electrolyte.

Tables.

Table S1. EDX analysis showing weight% of the elements present in the resulting developed BA and BF-1 samples.

Sample	C	O	Fe
BA	86	14	0.0
BF	81	17	2
BF-1	78	16	6
BF-2	66	21	13

Table S2. Comparative table for the electrochemical parameters of all developed catalysts towards OER operation in 1 M KOH electrolyte solution.

Sample	η_{10} (mV)	η_{100} (mV)	Tafel slope (mV dec^{-1})	R_{ct} (Ω)	ECSA (cm^2 mg^{-1})
Ni foam	345	455	103	7.9	…..
RuO2	305	390	90	2.9	56
BA	288	355	68	1.12	60
BF-1	238	280	40	0.89	68.2
BF-2	260	329	54	1.11	62.5

Table S3. Comparative table for the electrochemical parameters of optimized BF-1 catalyst towards OER operation in different electrolyte solution.

Sample	η_{10} (mV)	η_{50} (mV)	η_{100} (mV)	Tafel slope (mV dec^{-1})	R_{ct} (Ω)
1 M KOH	1.468	1.50	1.51	40	0.89
1 M KOH + 1 M NaCl	1.502	1.539	1.56	58	1.88
1 M KOH + Seawater	1.510	1.546	1.566	57	4.86

Table S4. Comparison table of electrocatalytic OER performance of various Fe as well as carbon based electrocatalyst in different electrolyte solution.

Catalysts	Electrolyte	Overpotential (mV)	Durability (h)	Ref.
Fe impregnated cellulosic carbon	1 M KOH	238 mV @ 10 mA cm^{-2}	50	This work
	1 M KOH + Seawater	280 mV @ 10 mA cm^{-2}	30	
Cellulosic Carbon	1 M KOH	288 mV @ 10 mA cm^{-2}	…	
N-doped porous carbon	1 M KOH	314 mV @ 10 mA cm^{-2}	8	1
Fe-N-C/FeP_x/NPSC	1 M KOH	370 mV@ 10 mA cm^{-2}	10	2
N, P doped carbon nanofiber encapsulated Fe_3O_4 and FeP nanoparticles	1 M KOH	330 mV@ 10 mA cm^{-2}	….	3
N, P dual doped graphene/carbon nanosheets (N, P-GCNS)	1 M KOH	340 mV@ 10 mA cm^{-2}	4.5	4
N_1-CoP@NPCNFs-900s	1 M KOH	266 mV@ 10 mA cm^{-2}	…..	5
CQDs/NiFe-LDH	1 M KOH	235 mV @ 10 mA cm^{-2}	……	6

$Ni_{0.9}Fe_{0.1}$/Nanocarbon hybrid	1 M KOH	330 mV@ 10 mA cm^{-2}	24	7
N-Fe-Cu co-doped carbon	1 M KOH	362 mV@ 10 mA cm^{-2}	20	8
Fe-Co_3O_4/CNTs	1 M KOH	300 mV@ 10 mA cm^{-2}	25	9
$Fe_{0.5}Co_{0.5}$@NC/NCNS-800	1 M KOH	270 mV@ 10 mA cm^{-2}	8	10
$(Ni_xFe_{1-x})2P$@graphitized carbon	1 M KOH	206 mV @ 10 $mAcm^{-2}$	30	11
Cr doped $FeNi_3/NiFe_2O_4$	1 M KOH	246 mV @ 20 $mAcm^{-2}$	200	12
MnFeCr LTH	1 M KOH + Seawater	341 mV @ 100 $mAcm^{-2}$	50	13
$Fe_{0.05}$CoNi LDH/NF	1 M KOH + Seawater	287 mV @ 10 $mAcm^{-2}$	14	14
Fe-NiMoSe@C	1 M KOH + Seawater	354 mV @ 500 $mAcm^{-2}$	100	15
Cr-CoFe LDH/NF	1 M KOH + Seawater	334 mV @ 500 $mAcm^{-2}$	100	16
S(-NiFe)OOH	1 M KOH + Seawater	300 mV @ 100 $mAcm^{-2}$	100	17
NiFeCrVMn HEA embedded LDH	1 M KOH + Seawater	300 mV @ 100 $mAcm^{-2}$	110	18
FeCoNiMnMo HEA	1 M KOH + Seawater	360 mV @ 100 $mAcm^{-2}$	119	19
NiCrCoFeMo layered hydroxide	1 M KOH + Seawater	258 mV @ 100 $mAcm^{-2}$	50	20

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