Electronic Supplementary Material (ESI) for Inorganic Chemistry Frontiers.

Electronic Supplementary information

Manganese ions conjugated on layered bismuth oxyhalide for high-performance pseudo-capacitor and efficient oxygen evolution catalyst

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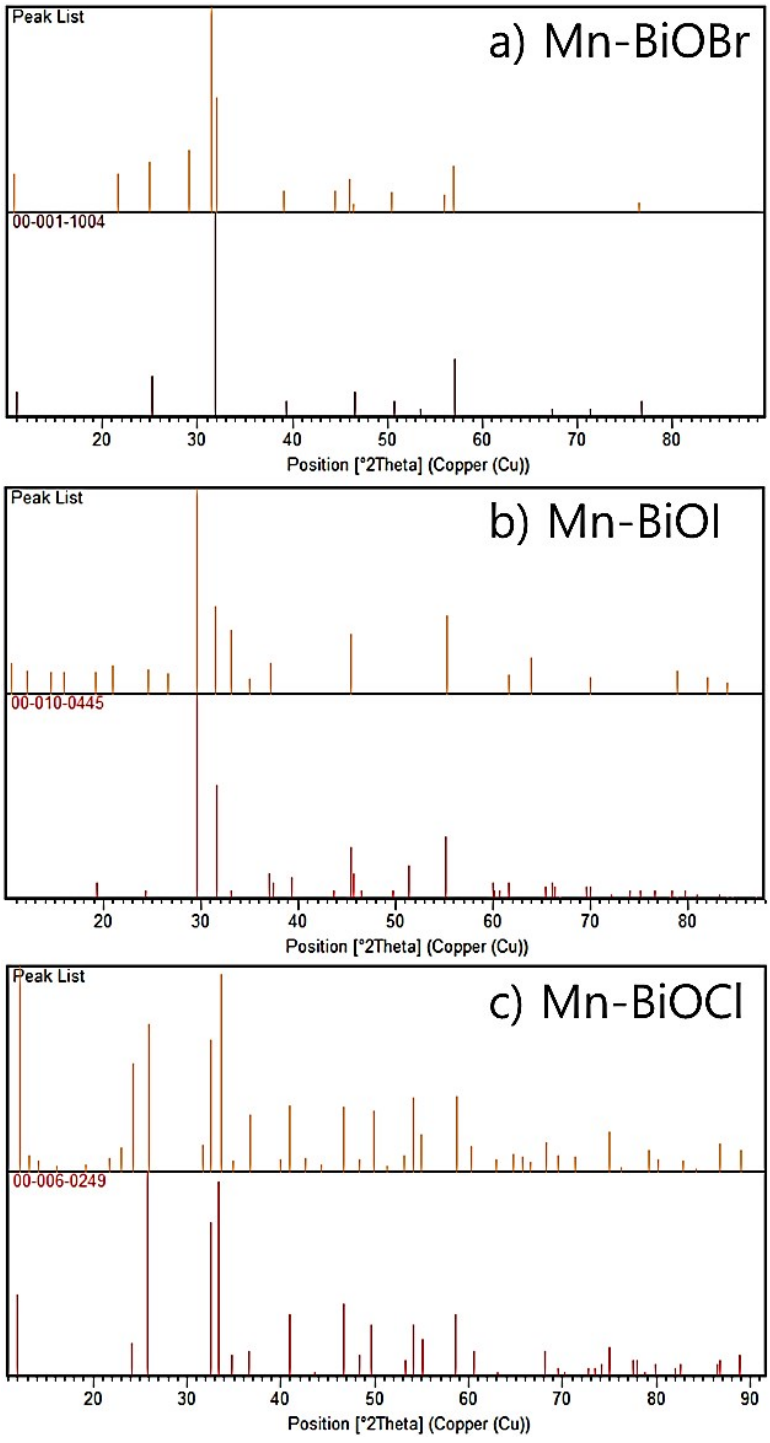

Fig. S1 Simulated XRD peak patterns for Mn-BiOX crystals.

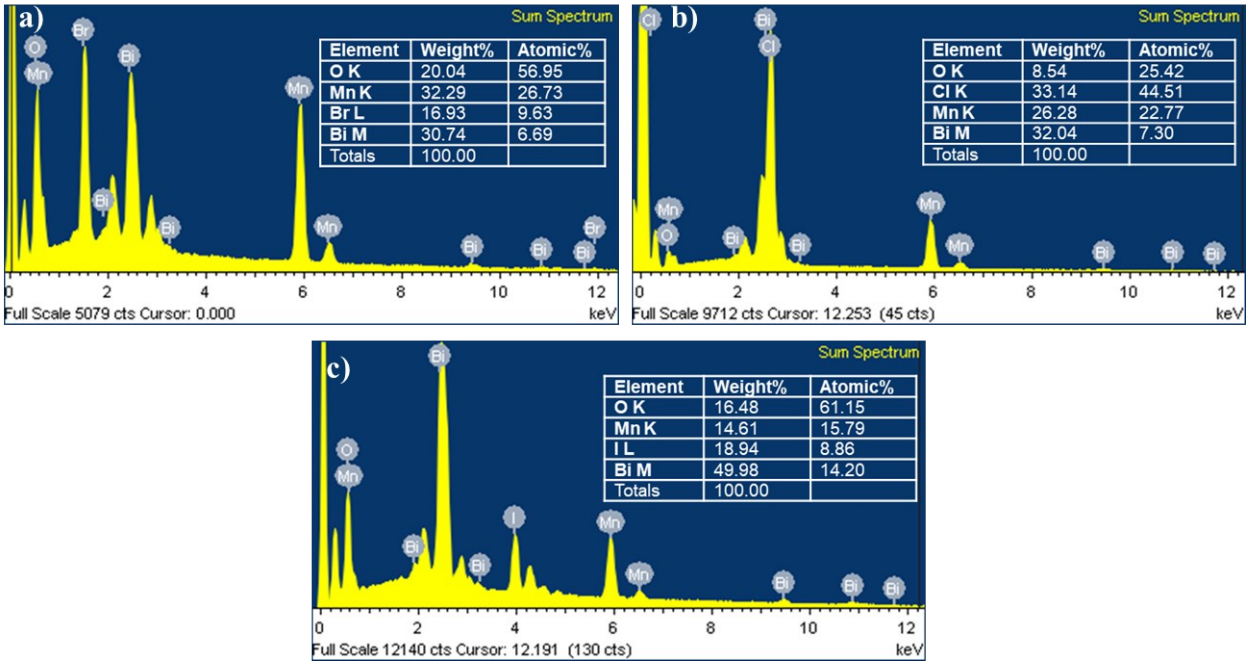

Fig. S2 EDS analysis for Mn-BiOX (X = Br, Cl and I) crystals.

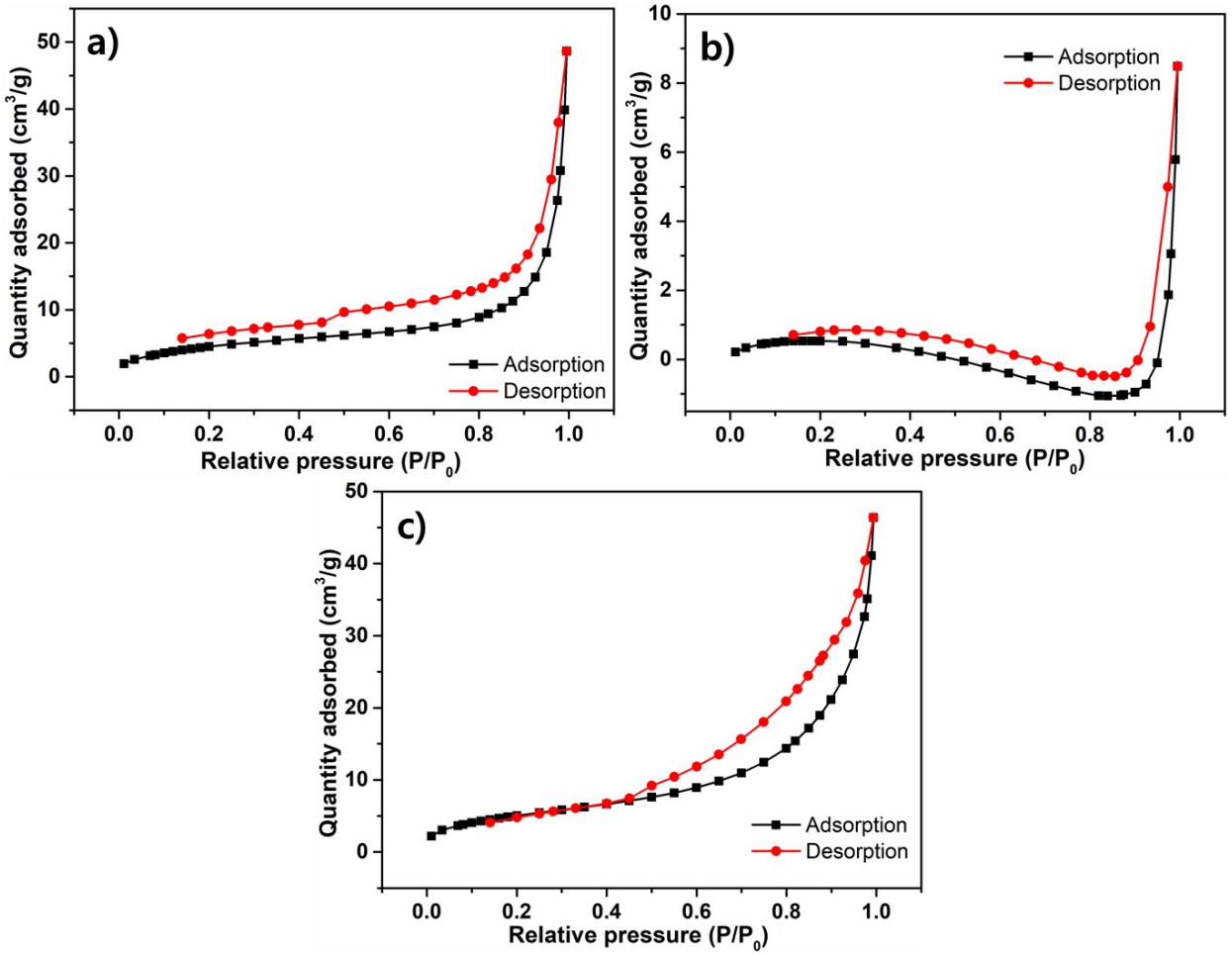

Fig. S3 Nitrogen adsorption-desorption isotherm of Mn-BiOX crystals (a: Mn-BiOBr, b: Mn-BiOI, and c: Mn-BiOCl).

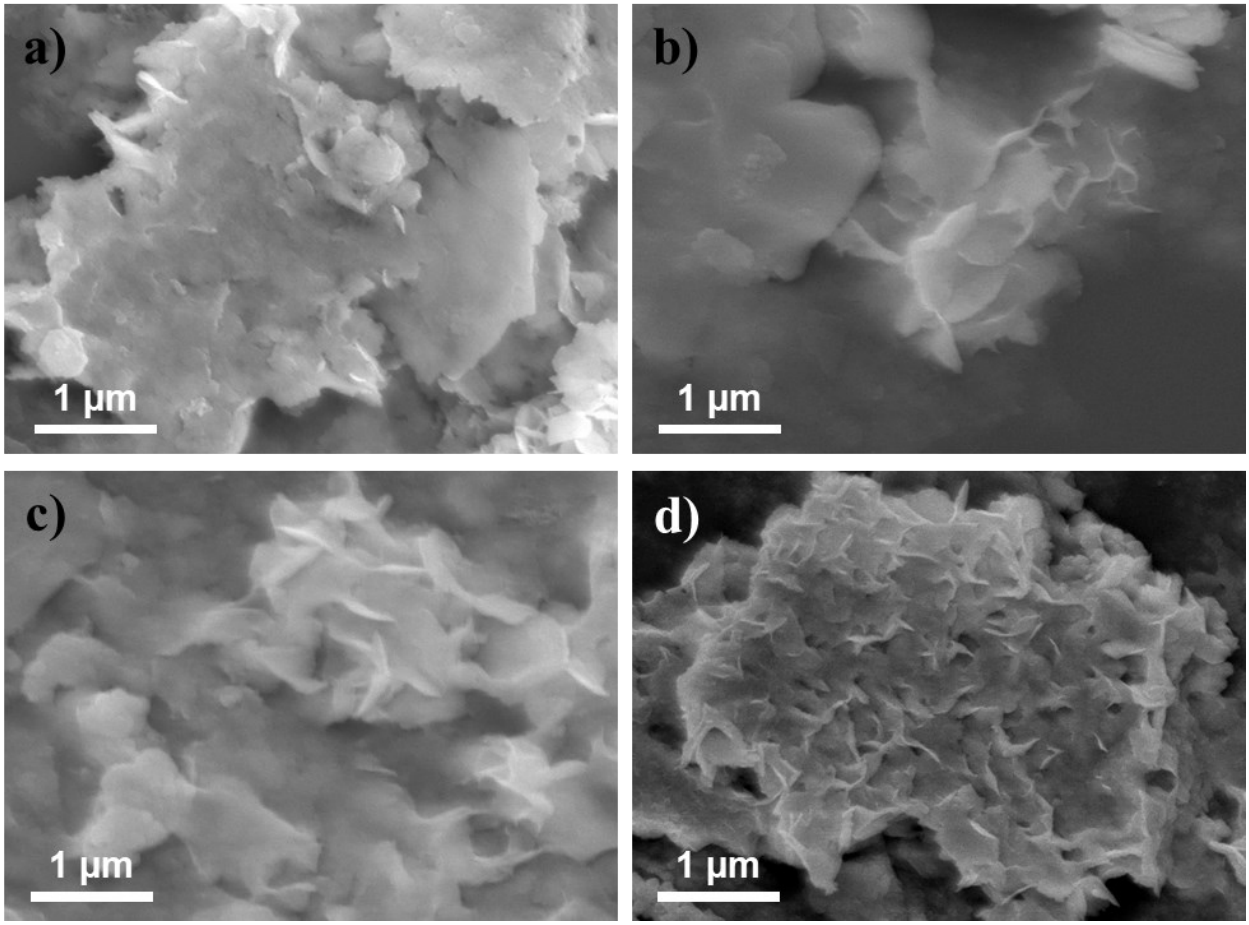

Fig. S4 FE-SEM images visualizing the growth mechanism of Mn-BiOCl material at various time intervals a) 1 h, b) 4 h, c) 8 h, and d) 12 h respectively.

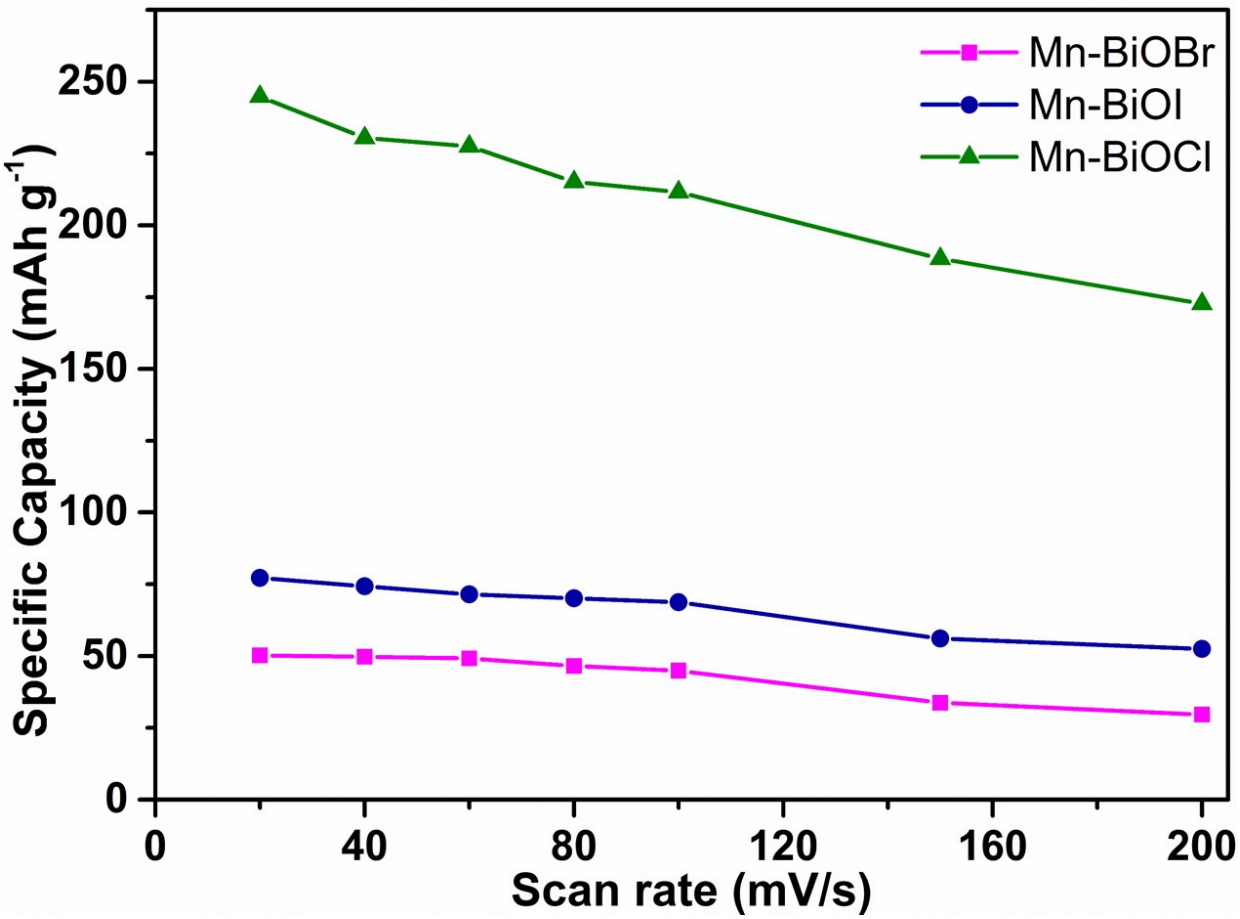

Fig. S5 Specific capacitance calculation through CV profiles for Mn-BiOX crystals.

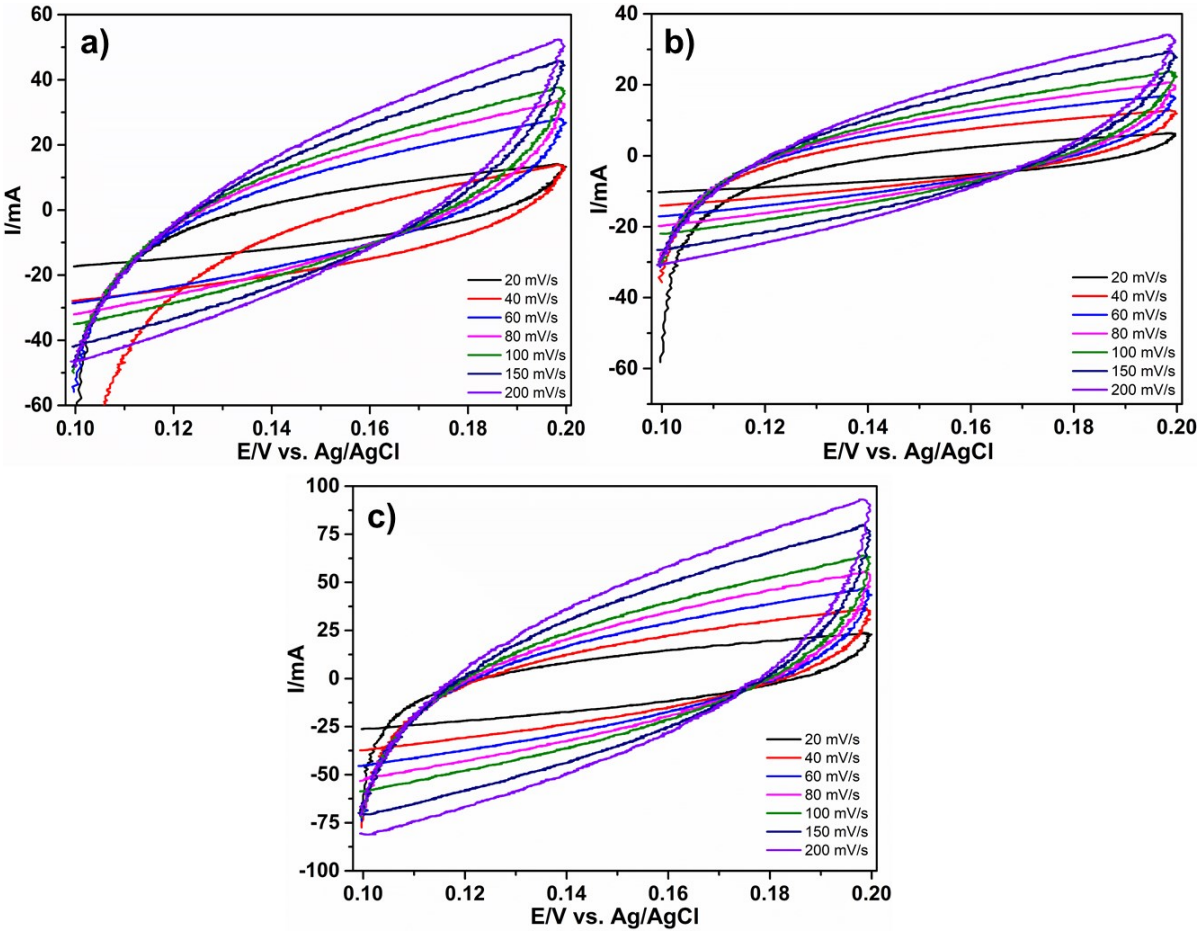

Fig. S6 CV profile for calculating double layer capacitance in the potential window of 0.1-0.2V using 1M KOH for the synthesized Mn-BiOX (X = Cl, Br, and I) materials.

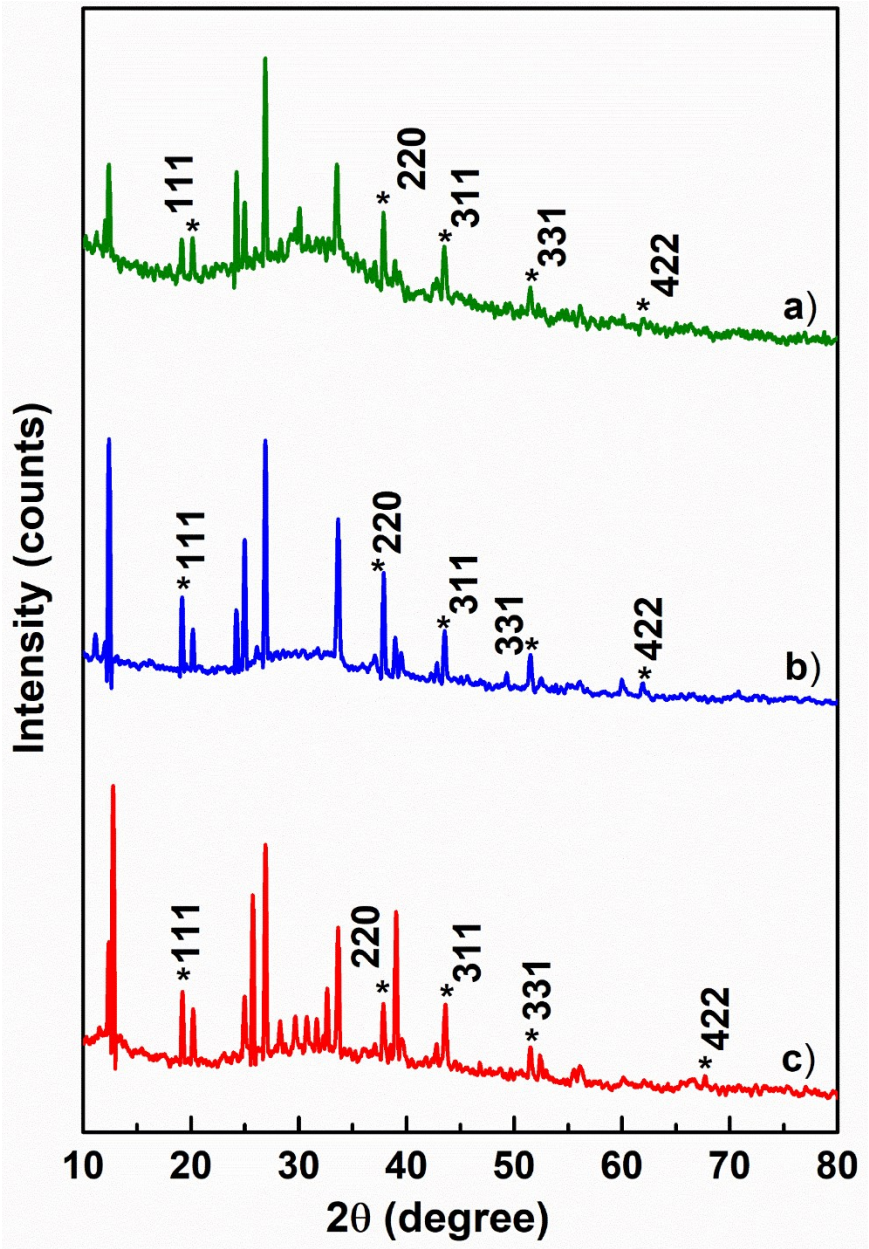

Fig. S7 XRD analysis after performing the chronoamperometric analysis for measuring the material stability (a: Mn-BiOBr, b: Mn-BiOI and c: Mn-BiOCl).

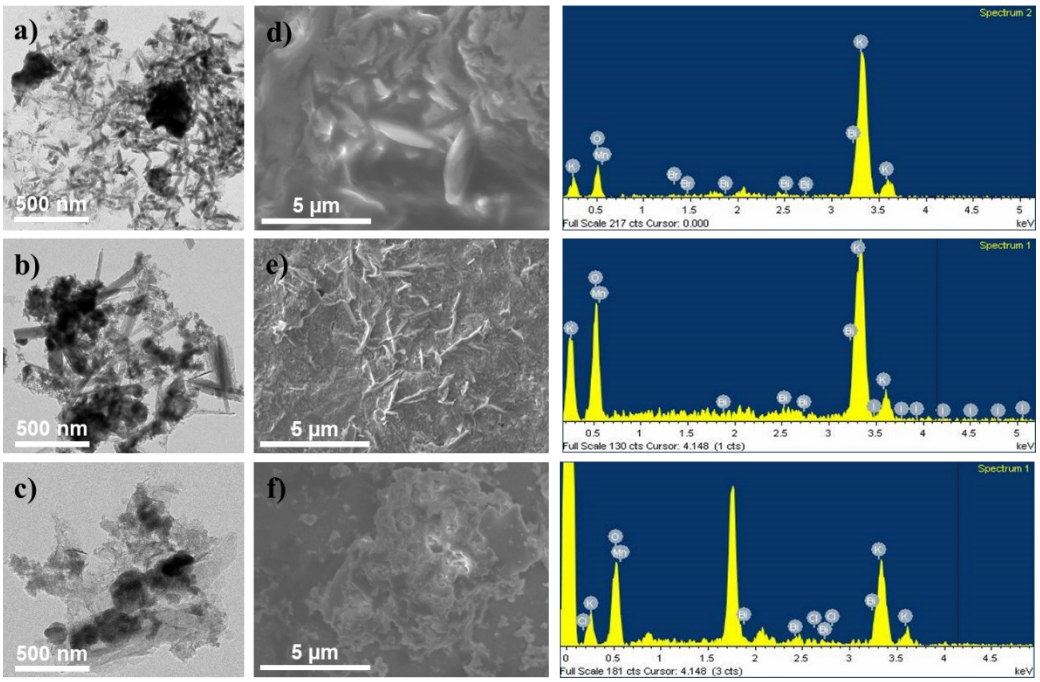

Fig. S8 TEM, FE-SEM and EDS analysis after performing the chronoamperometric analysis for measuring the material stability (a, d: Mn-BiOBr, b, e: Mn-BiOI and c, f: Mn-BiOCl)

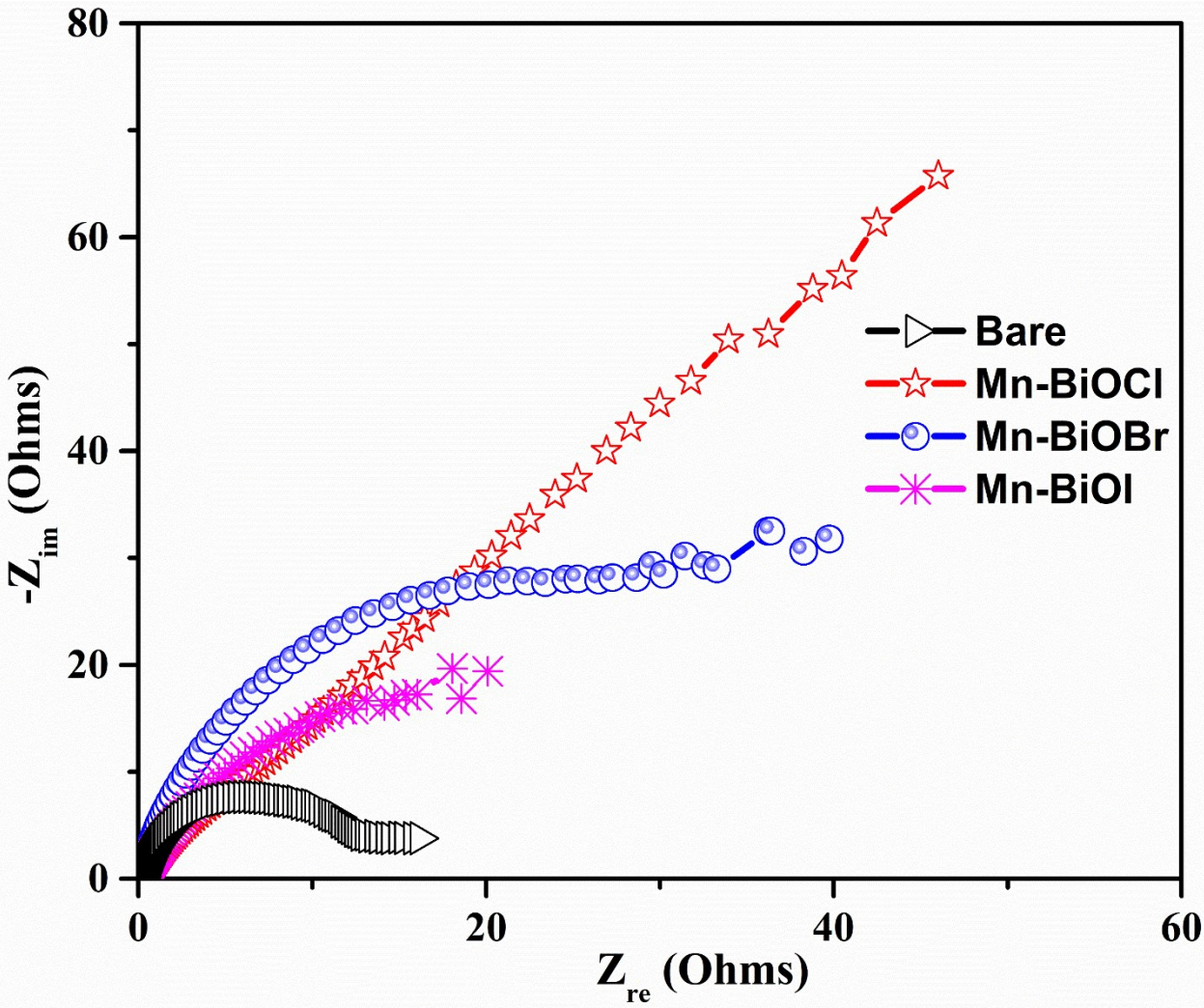

Fig. S9 Nyquist plot analysis after performing the chronoamperometric analysis for measuring the material stability.

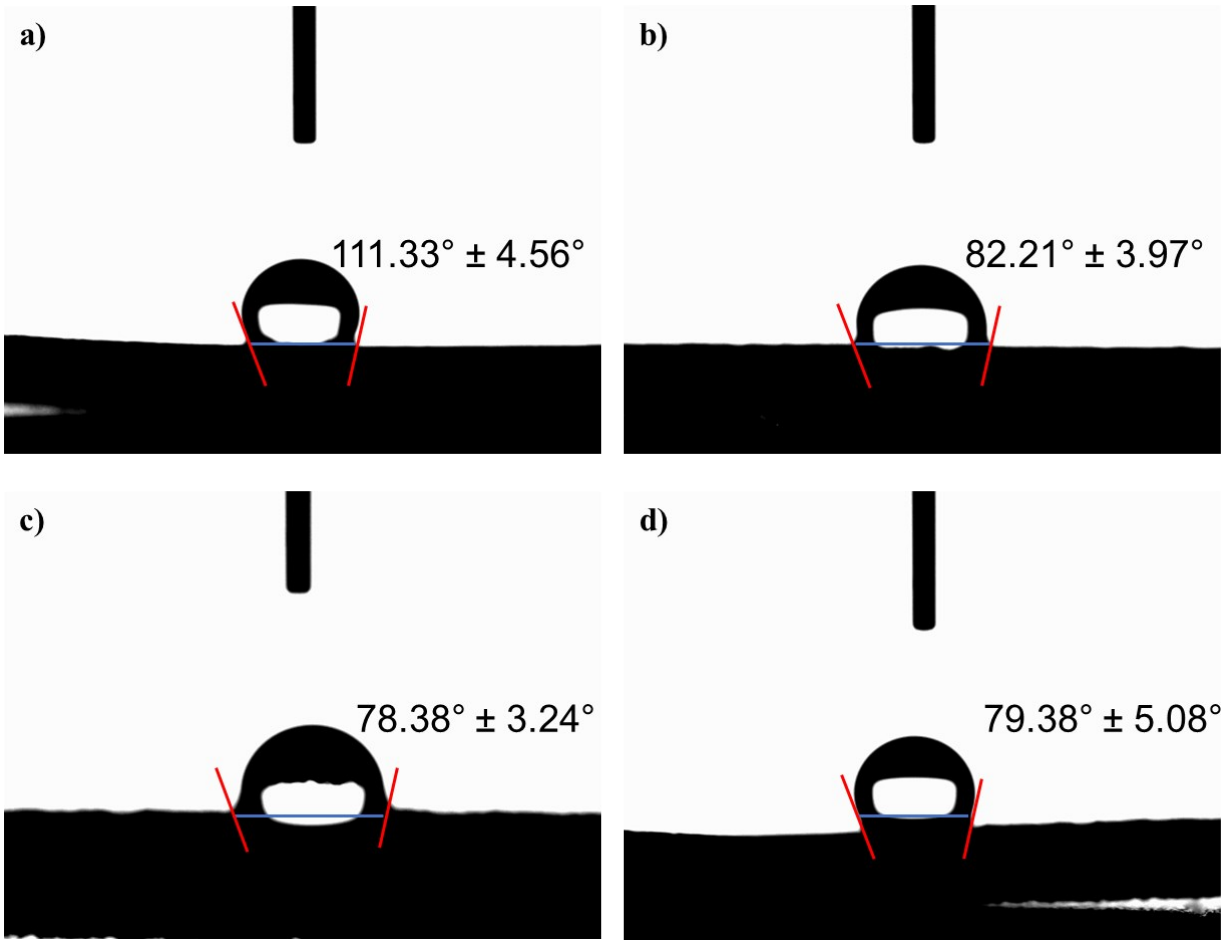

Fig. S10 Contact angle measurement strategy to determine the bonding nature between the electrode and synthesized materials a) bare electrode, b) Mn-BiOBr modified electrode, c) Mn-BiOCl modified electrode and d) Mn-BiOI modified electrode.

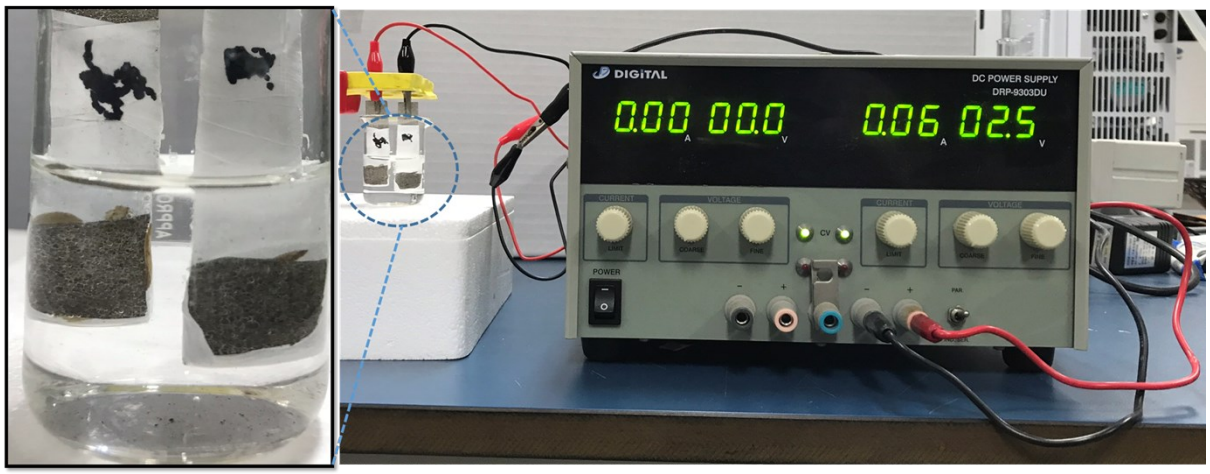

Fig. S11 Practical applicability of the synthesized materials.

Table. S1 Electrochemical Impedance spectroscopic values for Mn-BiOX (X= Br, I and Cl)

Electrode surface	**Fitting Parameters**			
	R_S (Ω)	**C_{dl} (F)**	**R_{ct} (Ω)**	**Warburg (Ω)**
Bare	2	5.421×10^{-6}	8	4.43×10^{-7}
Mn-BiOBr	3	2.142×10^{-7}	5	5.16×10^{-5}
Mn-BiOI	1.5	1.111×10^{-6}	3.5	5.08×10^{-5}
Mn-BiOCl	1	3.939×10^{-7}	2	1.72×10^{-5}

Table. S2 Comparative capacitance study analysis with other materials

S.No	Materials	SC (F/g)	ED (Wh/Kg)	PD (W/Kg)	Stability (%)	Ref
1.	$BiOI/Bi_9I_2$	122.43	38.2	228.4	90.1	S1
2.	BiOCl/Fe(III)	540	17	500	72	S2
3.	BiOCl/MXene	247.8	15.2	567.4	57.5	S3
4.	$Bi_7O_9I_3$	347	-	-	65.5	S4
5.	BiOI	706	-	-	55	S5
6.	BiOCl/AC	1243	17.2	250.9	90.3	S6
7.	BiOCl/PANi	169.9	-	-	-	S7
8.	Bi_2O_3-MnO_2	161	18.4	600	95	S8
9.	Bi_2O_3	322.5	7.2	334.7	92	S9
10.	Bi_2O_3/rGO	617.1	-	-	79.5	S10
11.	Mn-BiOBr	676.8	6.47	918.75	89.4	This Work
	Mn-BiOI	861.7	10.9	831.25	88.6	
	Mn-BiOCl	2291.3	25.77	1400	86.4	

Table. S3

S. No	Material	Electrolyte	Overpotential / mV	Tafel / mV dec^{-1}	Reference
1.	Bi_2S_3/Ni_3S_2	1M KOH	268	82	S11
2.	MA_2CoBr_4	PBS	528	197	S12

3.	$Fe_{1.75}Mn_{0.25}P$	1M KOH	620	100	S13
4.	Mn-BiOCl	2M KOH	325	160	This work
	Mn-BiOI		378	192	
	Mn-BiOBr		485	214	

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