Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

Supporting information

Preparation of $BiOIO_3$ nanosheets

In order to minimize the influence of experimental conditions on the experimental results, we prepared $BiOIO_3$ nanosheets using a similar hydrothermal process. 1 mmol $Bi(NO_3)_3 \cdot 5H_2O$ was weighed and dissolved in 40 ml of deionized water with intense stirring until forming a milky white suspension. At the same time, 1 mmol KIO_3 was dissolved in 20 ml of deionized water until the solution was clear and transparent. The two solutions were mixed and stirred continuously for 10 min, and the obtained solution was transferred to 100 ml of Teflon-lined stainless-steel autoclave and heated at 180 ℃ for 10 h. After cooling naturally to room temperature, the solution was washed with deionized water and anhydrous ethanol for three times, respectively. Finally, the pure $BiOIO_3$ nanosheets were obtained by drying at 60 °C for 24 h.

Preparation of $Bi_2O_2CO_3$ nanosheets

Firstly, 2 mmol of $Bi(NO_3)_3 \cdot 5H_2O$ was dissolved in 40 ml of deionized water and stirred continuously until the solution was completely transformed into a milky white suspension. Then 6 mmol of CH_4N_2O was added to the above solution and stirred continuously for 10 min. Similarly, the resulting solution was transferred to a 100 ml Teflon-lined stainless-steel autoclave and kept warm at 180 ℃ for 24 h. After cooling naturally to room temperature, the solution was washed with deionized water and anhydrous ethanol for three times, respectively. Finally, the pure $Bi_2O_2CO_3$ nanosheets were obtained by drying at 60 °C for 24 h.

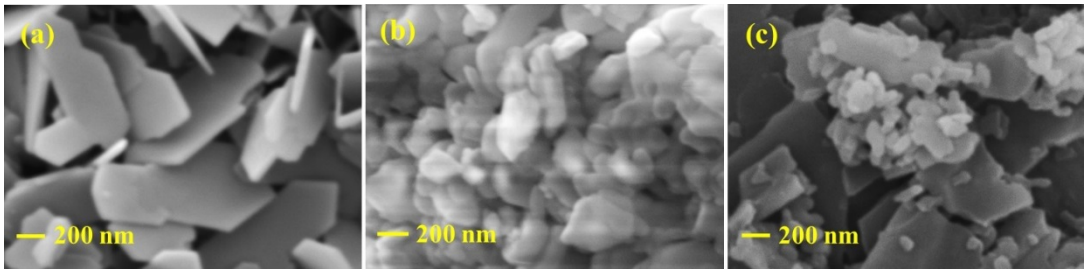

Fig. S1 SEM diagram of (a) $BiOIO_3$; (b) $Bi_2O_2CO_3$; (c) $BiOIO_3/Bi_2O_2CO_3$

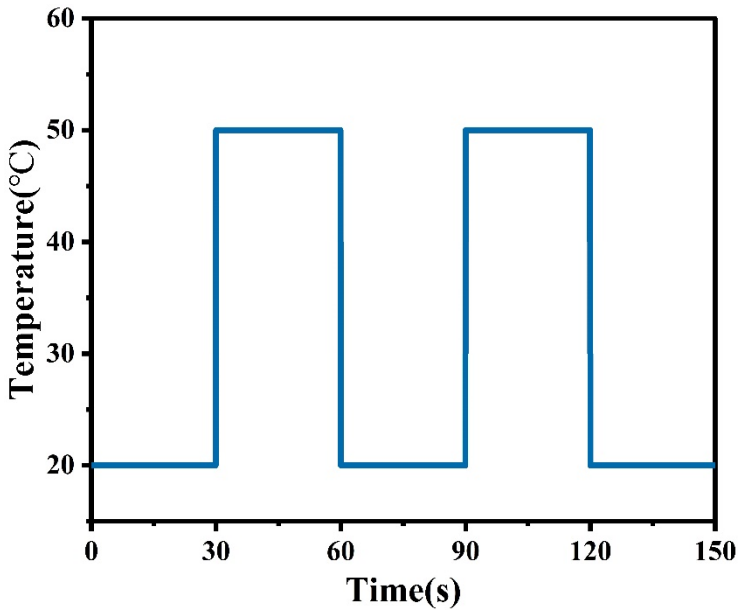

Fig. S2 The ideal temperature curve for cold-hot cycle

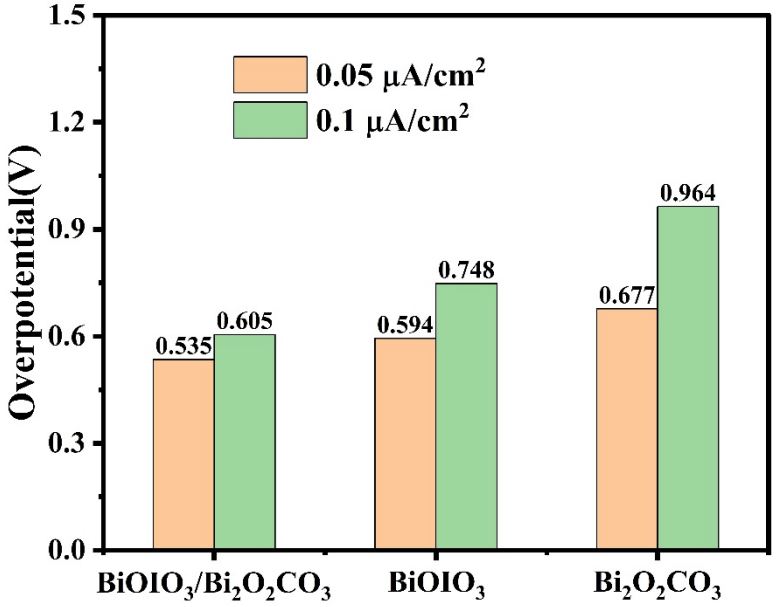

Fig. S3 The overpotential of $BiOIO_3$, $Bi_2O_2CO_3$ and $BiOIO_3/Bi_2O_2CO_3$ at 0.05 μA/cm² and 0.1 μA/cm²

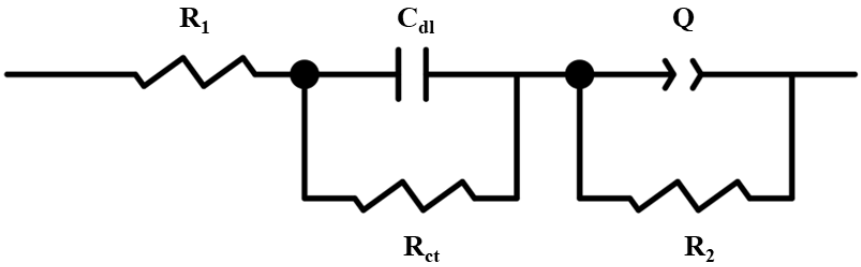

Fig. S4 The equivalent circuit diagram of electrochemical impedance

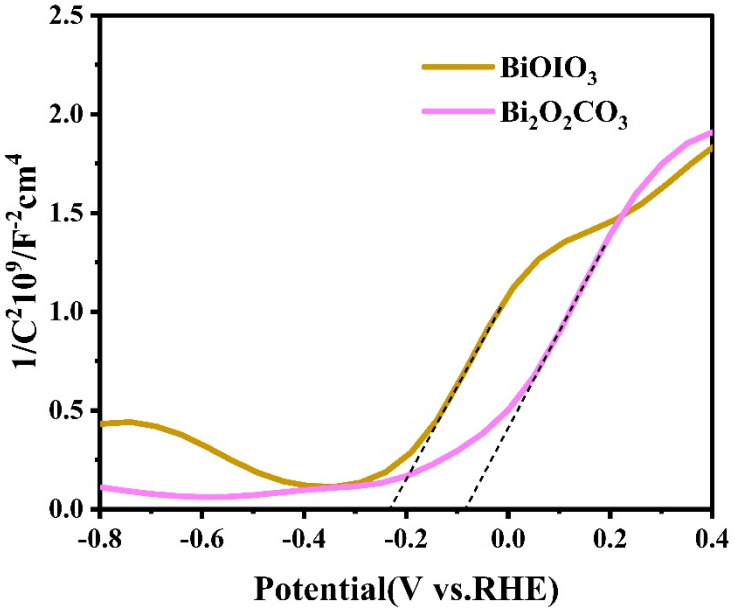

Fig. S5 Mott-Schottky plots of $BiOIO_3$ and $Bi_2O_2CO_3$ under the dark condition

Tab. S1 Atomic coordinate information, occupancy and thermodynamic parameters of $BiOIO_3$ obtained by Rietveld refining using X-ray powder diffraction data at room temperature

Atom	x	y	z	Occupancy	Uiso/Å^2	Mult
Bi	0.01549	0.11358	0.69145	1	0.00966	4
I	0.49333	0.36772	0.66828	1	0.00760	4
O1	0.20006	0.01017	0.98665	1	0.06805	4
O2	0.56433	0.20017	0.55160	1	0.55500	4
O3	0.62065	0.35110	0.89994	1	0.19795	4
O4	0.26085	0.38618	0.82996	1	0.03888	4

Tab. S2 Atomic coordinate information, occupancy and thermodynamic parameters of $Bi_2O_2CO_3$ obtained by Rietveld refining using X-ray powder diffraction data at room temperature

Atom	x	y	z	Occupancy	Uiso/Å^2	Mult
Bi1	0.00000	0.00000	0.05936	1	0.02622	2
Bi2	0.50000	0.50000	0.24489	1	0.00093	2
C	0.00000	0.00000	0.30161	1	0.07733	2
O1	0.00000	0.50000	0.06734	1	0.62014	2
O2	0.50000	0.00000	0.12474	1	0.08056	2
O3	0.00000	0.45356	0.25525	1	0.60645	2
O4	0.00000	0.00000	0.40690	1	0.24719	2

Tab. S3 The band gap width values of $BiOIO_3$, $Bi_2O_2CO_3$ and $BiOIO_3/Bi_2O_2CO_3$

Sample	**$BiOIO_3$**	**$Bi_2O_2CO_3$**	**$BiOIO_3/Bi_2O_2CO_3$**
Band gap (eV)	2.99	3.21	2.56

Tab. S4 Flat band potential (V_{fb}) of electrodes deduced from Mott-Schottky

Sample	**$BiOIO_3$**			**$BiOIO_3/Bi_2O_2CO_3$**		
Conditions	light	ΔT	light+ ΔT	light	ΔT	light+ ΔT
V_{fb} (V) Vs. RHE	-0.383	-0.213	-0.481	-0.423	-0.356	-0.537