Electronic Supplementary Information (ESI)

Synthesis and Characterization of Sb_2O_3: a Stable Electrocatalyst for Efficient H_2O_2 Production and Accumulation and Effective Degradation of Dyes

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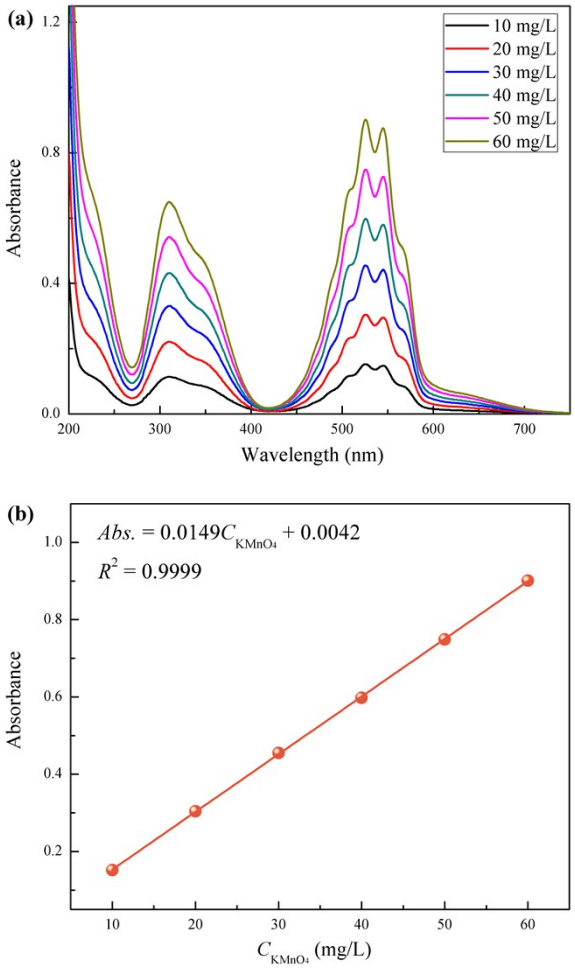

Figure S1. (a) UV-vis absorption spectra of the $KMnO_4$ solution with various concentrations. (b) Linear relationship between absorbance at 525 nm and the concentration of $KMnO_4$.

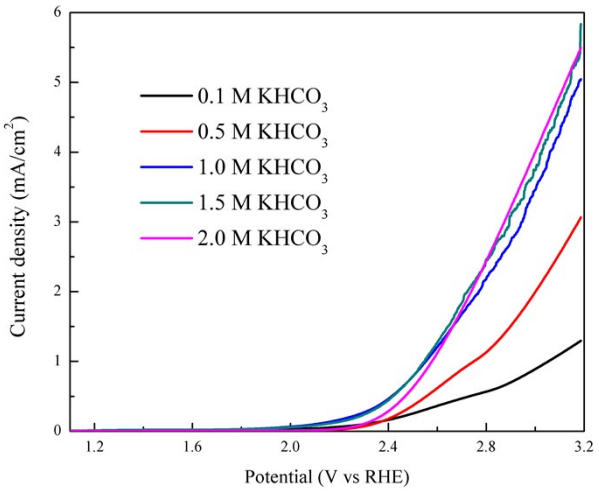

Figure S2. Linear sweep voltammetry curves of the Sb_2O_3 films tested in $KHCO_3$ solution with different concentrations. The scan rate is 25 mV/s.

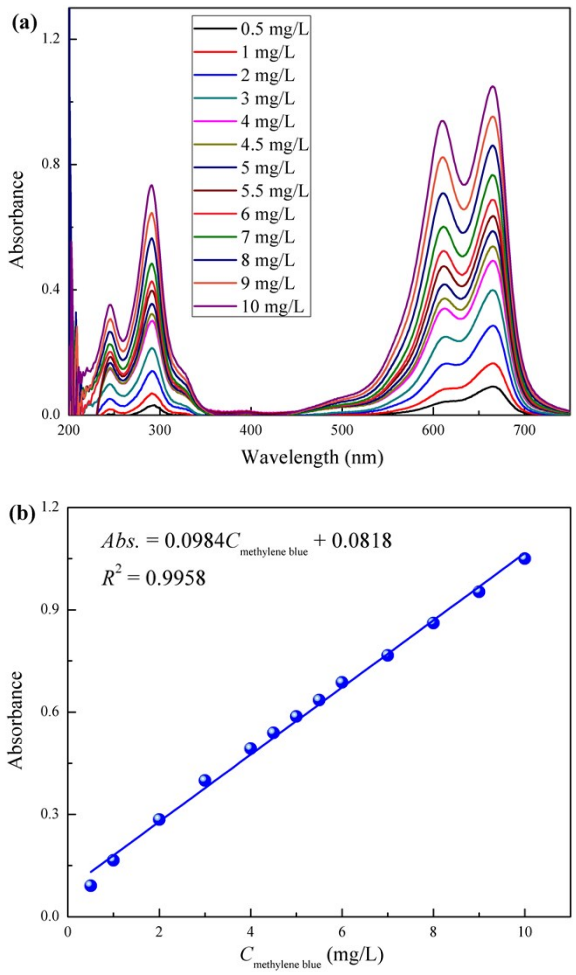

Figure S3. (a) UV-vis absorption spectra of the methylene blue solution with various concentrations. (b) Linear relationship between absorbance at 664 nm and the concentration of methylene blue.

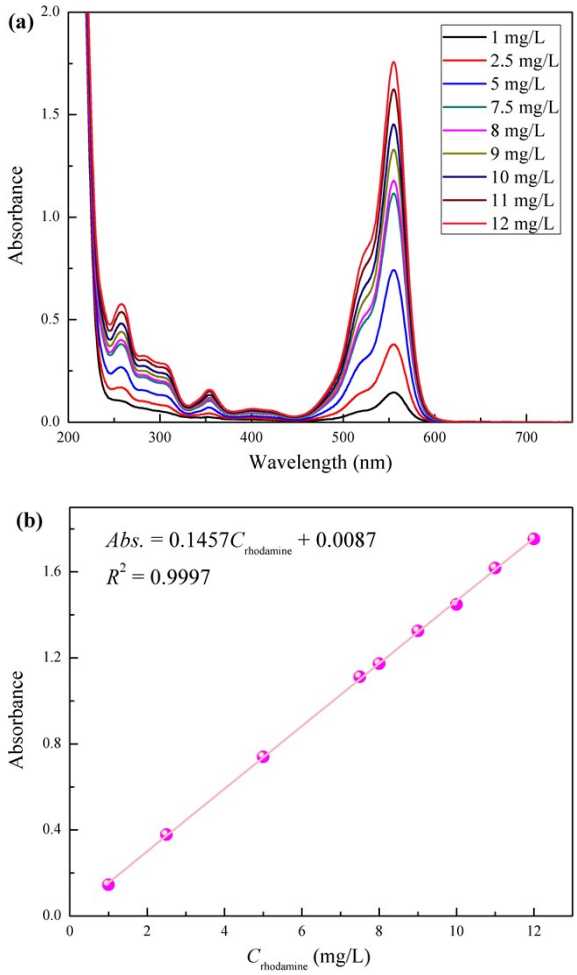

Figure S4. (a) UV-vis absorption spectra of the rhodamine B solution with various concentrations. (b) Linear relationship between absorbance at 554 nm and the concentration of rhodamine B.

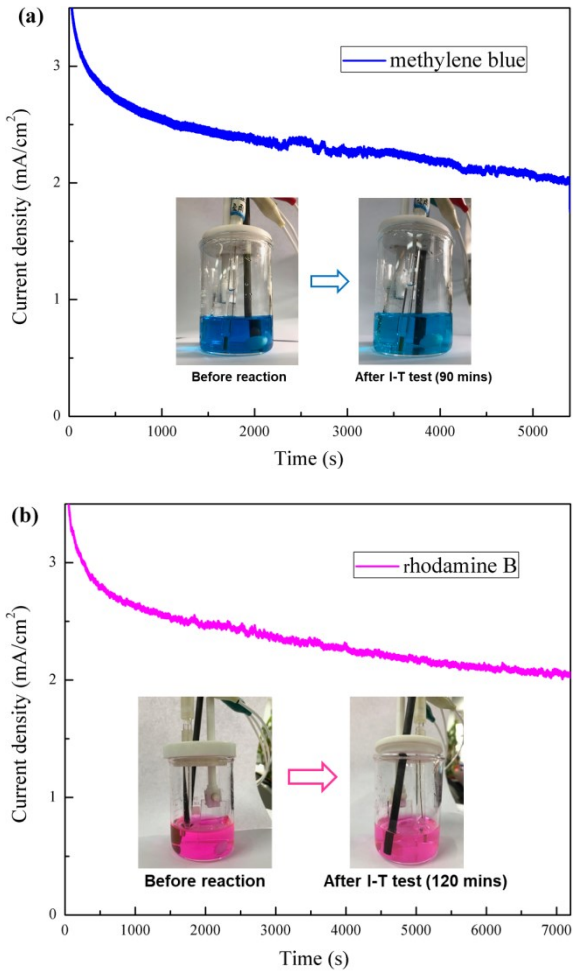

Figure S5. Current-time curves of the Sb_2O_3 film at 3.08 V vs RHE tested in 0.2 M Na_2SO_4 aqueous solution (a) containing 10 mg/L methylene blue and (b) 7.5 mg/L rhodamine B respectively. The insets show the color change of the solution before and after the reaction.

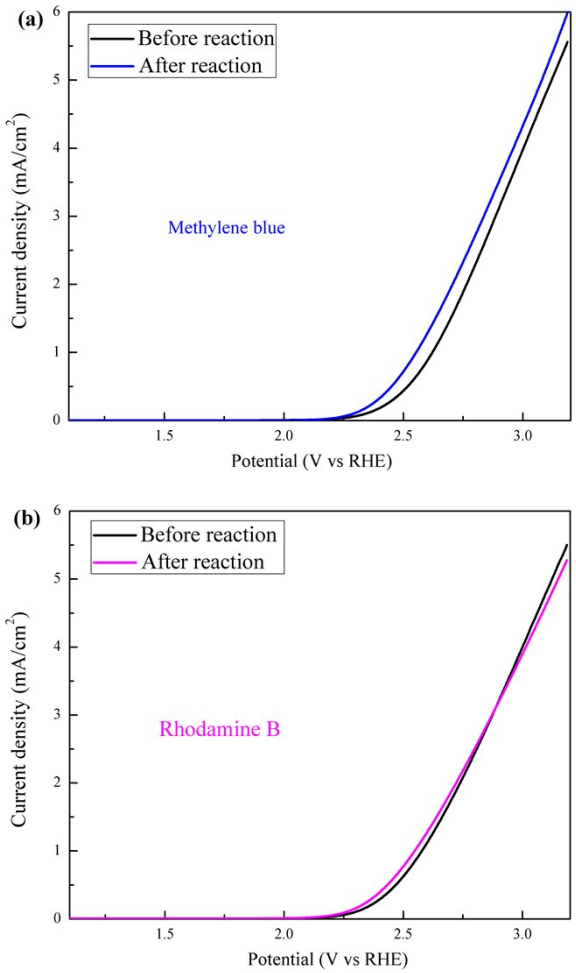

Figure S6. Linear sweep voltammetry curves of the Sb_2O_3 films before and after the chronoamperometry test for the degradation of (a) methylene blue and (b) rhodamine B respectively. The degradation experiments are conducted at 3.08 V vs RHE in 2 M $KHCO_3$ aqueous solution containing 10 mg/L methylene blue and 7.5 mg/L rhodamine B respectively.

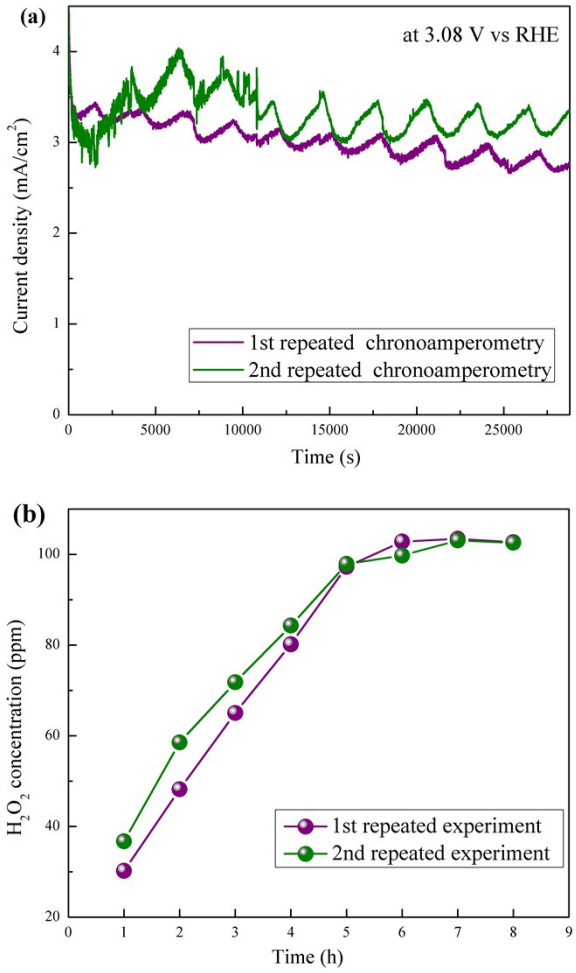

Figure S7. (a) Repeated chronoamperometry tests of Sb_2O_3 films for 8 hours at 3.08 V vs RHE. The electrolyte is 2 M $KHCO_3$ aqueous solution (30 mL) with an ice bath (5 ℃) and the reaction area is 3 cm^2. (b) Accumulated H_2O_2 concentrations of different reaction times.

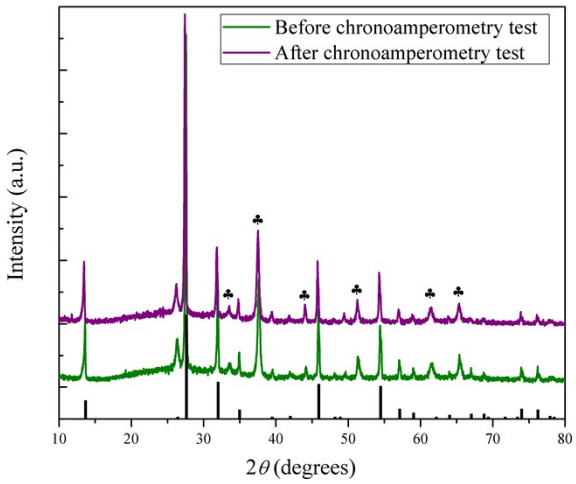

Figure S8. XRD patterns of the Sb_2O_3 film before and after the chronoamperometry test for 3 hours at 3.08 V vs RHE in 2 M $KHCO_3$ aqueous solution.

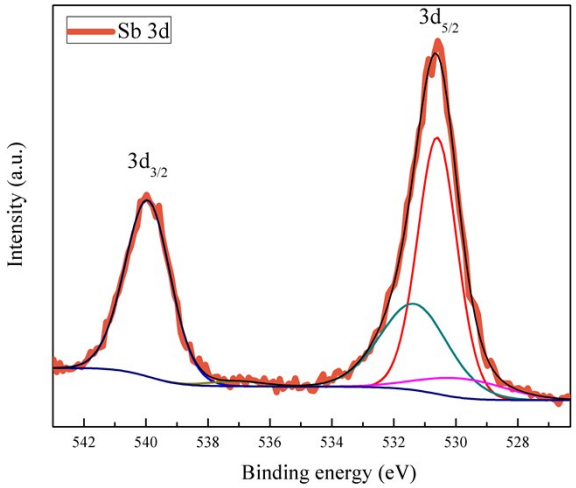

Figure S9. XPS spectra of Sb 3d collected from the Sb_2O_3 film after 8 hours chronoamperometry test at 3.08 V vs RHE in 2 M $KHCO_3$ aqueous solution.

Table S1. Comparisons of the H_2O_2 production rate and FE between Sb_2O_3 and those reported electrocatalysts in literature.

Catalyst	Production rate (μmol cm^{-2} min^{-1})	FE (%)	Electrolyte	Reaction time	Potential (vs RHE)	Ref.
WO_3	~0.24	~46	1 M $NaHCO_3$	10 min	~2.3 V	[1]
SnO_2	~1.25	~50	1 M $NaHCO_3$	10 min	~3.1 V	[1]
TiO_2	~0.75	~18	1 M $NaHCO_3$	10 min	~3.3 V	[1]
$BiVO_4$	~5.40	~70	1 M $NaHCO_3$	10 min	~3.1 V	[1]
$BiVO_4$ (seed)	0.63 mM/cm^2	11.4	1 M $KHCO_3$	15 min	3.08 V	[2]
$BiVO_4$(nanoneedles)	0.4 mM/cm^2	12.7	1 M $KHCO_3$	15 min	3.08 V	[2]
$BiVO_4$(truncated)	0.24 mM/cm^2	13.3	1 M $KHCO_3$	15 min	3.08 V	[2]
(10$\bar{1}$0)ZnO	/	~75	2 M $KHCO_3$	20 min	3.0 V	[3]
(0001)ZnO	/	~60	2 M $KHCO_3$	20 min	3.0 V	[3]
$CaSnO_3$	~4.25	76	2 M $KHCO_3$	10 min	3.2 V	[4]
C,N codoped TiO_2	0.29 μmol L^{-1} cm^{-2} h^{-1}	8	0.05 M Na_2SO_4	/	2.9 V vs Ag/AgCl	[5]
6% Gd:$BiVO_4$	~2.7	~70	2 M $KHCO_3$	10 min	3.0 V	[6]
Bi_2WO_6:5%Mo	~4.8	~79	2 M $KHCO_3$	/	3.2 V	[7]
Sb_2O_3	~0.26	~21.5	2 M $KHCO_3$	5 min	3.08 V	**This work**

References

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