Oxygen-Vacancy-Rich BiOCl Materials with Ultra-High Photocatalysis Efficiency by Etching Bismuth Glass

Wenjing Dong[a,b], Tianyi Xie[a] , Zhilun Wu[d], Haiyi Peng[a], Haishen Ren[a], Fancheng Meng[c,*], Huixing Lin[a,b,*]

a. Key Laboratory of Inorganic Functional Materials and Devices, Shanghai Institute of Ceramics, Chinese Academy of Sciences, Shanghai 201800, China.

b. Education Ministry Key Lab of Resource Chemistry and Shanghai Key Laboratory of Rare Earth Functional Materials, Shanghai Normal University, Shanghai, 200234, China

c. College of Materials Science and Engineering, Chongqing University of Technology, Chongqing 400054, China

d. United Microelectronics Center LTD

Corresponding authors: mengfancheng@cqut.edu.cn, huixinglin@mail.sic.ac.cn

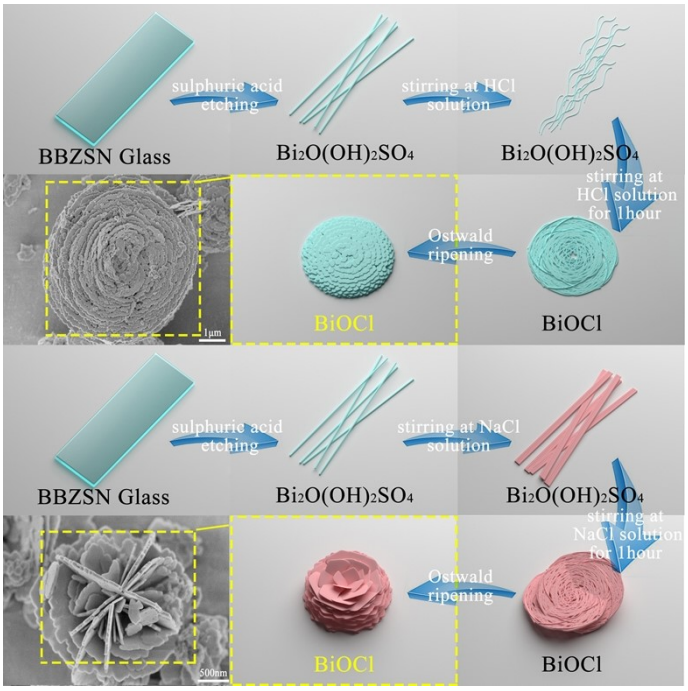

Figure S1. Schematic diagram illustrating formation process of as-prepared BiOCl samples.

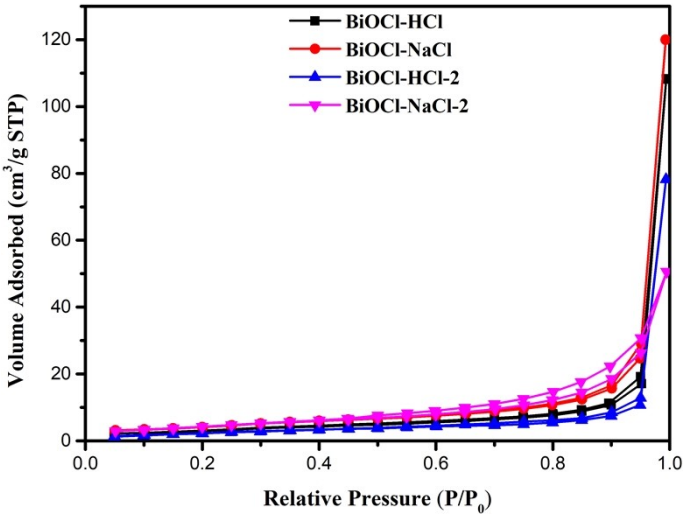

Figure S2. Nitrogen adsorption-desorption isotherm of as-prepared BiOCl samples.

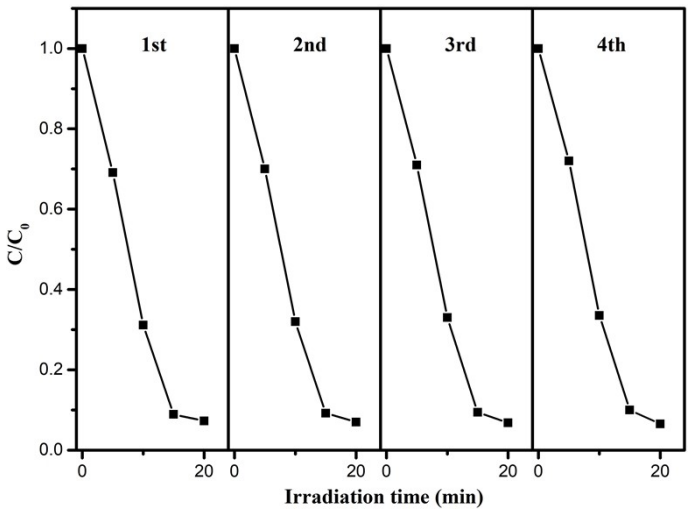

Figure S3. Cyclic photocatalytic RhB degradation test using flower-shaped BiOCl-NaCl.

Table S1. Parameters showing XPS result of as-prepared BiOCl samples.

	Bi 4f	Cl 2p	O 1s	C 1s
BiOCl-HCl	16.88	18.39	29.55	35.17
BiOCl-NaCl	15.51	16.55	31.4	36.55
BiOCl-HCl-2	13.69	13.85	35.8	36.66
BiOCl-NaCl-2	15.69	16.36	40.96	26.98

Table S2. Comparison with respect to specific surface area, average pore size and pore volume of as-prepared BiOCl samples.

Sample	**S_{BET}(m^2/g)**	**Average pore size (nm)**	**Pore volume (cm^3/g)**
BiOCl-HCl	10.996	322.1	0.167
BiOCl-NaCl	16.094	292.3	0.186
BiOCl-HCl-2	8.795	312.1	0.121
BiOCl-NaCl-2	16.683	363.9	0.078

Table S3. Pseudo-first-order rate constant for RhB photocatalytic oxidation using different photocatalysts.

Sample	$k_{uv}(min^{-1})$	$k_{vis}(min^{-1})$
BiOCl-HCl	0.13707	0.01266
BiOCl-NaCl	0.16016	0.01658
BiOCl-HCl-2	0.07892	0.00793
BiOCl-NaCl-2	0.1218	0.02221

Table S4. Comparison of the obtained specific surface area and photocatalysis performance results with literature data of the catalysts.

Materials	S_{BET} (m^2/g)	Catalyst Amount	Pollutant content(RhB)	Light Type	Degradation Rate	Ref.
BiOCl-NaCl	**16.094**	**10mg**	**10mg/L 100ml**	**Ultraviolet light(λ<400nm) Visible light(λ>400nm)**	**92.7% in 20min 71.4% in 20min 92.8%in 100min**	**This work**
BiOCl	-	50mg	20mg/L 100ml	Ultraviolet light(λ<420nm)	90% in 140 min	1

BiOCl	5.6	30mg	10mg/L 100ml	UV-vis light (200nm<λ<800nm)	98.1% in 195 min	19
BiOCl/TU	56.07	20mg	20mg/L 50ml	Visible light(λ>420nm)	95% in 20 min	20
BiOCl	-	20mg	20mg/L 30ml	Ultraviolet light(λ<420nm)	100% in 120 min	60
BiOCl/PVP	23.8	20mg	20mg/L 30ml	Ultraviolet light(λ<380nm)	97% in 40 min	61
BiOCl/Eu^{3+}	-	10mg	20mg/L 30ml	Ultraviolet light(λ=360nm)	100% in 120 min	62
BiOCl/ $ZnSn(OH)_6$	-	100mg	48mg/L 100ml	Visible light(λ>420nm)	94.1% in 120 min	63
BiOCl/ CTAB	-	10mg	10mg/L 100ml	Visible light(λ>420nm)	99.7% in 180 min	64
p-BiOCl/ n-$ZnFe_2O_4$	-	50mg	10mg/L 50ml	Visible light(λ>420nm)	97% in 180 min	65
BiOCl/TiO_2/ Clinoptilolite	43.93	100mg	10mg/L 100ml	Visible light(λ>420nm)	98.03% in 360 min	66