

Supplementary Information

Optimizing CO₂ photoreduction on bismuth oxyhalides via intrinsic and extrinsic techniques

Malik Zeeshan Shahid^a, Zhihao Chen^a, Rashid Mehmood^b, Meng Zhang^a, Danrui Pan^a, Shishun Xu^a, Umar Farooq^a, Ahmed Mahmoud Idris^a, Zhengquan Li^{a,c*}

^aKey Laboratory of the Ministry of Education for Advanced Catalysis Materials, Zhejiang Normal University, Jinhua, Zhejiang 321004, P. R. China

^bState Key Laboratory of Catalysis, iChEM, Dalian Institute of Chemical Physics, Chinese Academy of Sciences, Dalian National Laboratory for Clean Energy, Dalian 116023, China

^cZhejiang Institute of Photoelectronics, Zhejiang Normal University, Jinhua, Zhejiang 321004, China

*Corresponding author: zqli@zjnu.edu.cn

Table S1. PCR activity of diverse BiOX photocatalysts regulated *via* intrinsic or extrinsic techniques in the past decade.

BiOX photocatalysts tuned with Intrinsic techniques for PCR

Entry #	Photocatalyst	Mass (mg)	PCR conditions	Products ($\mu\text{mol.g}^{-1}.\text{hr}^{-1}$)			Ref.
				CO	CH ₄	CH ₃ OH	
1	BiOCl	50	10 mL H ₂ O, CO ₂ gas	8.99	~0.5	~0.3	[1]
2	BiOCl	50	1.3 g NaHCO ₃ , 10 mL H ₂ SO ₄ (4mol/L)	19.7	~0.7		[2]
3	BiOCl	10	H ₂ O vapor, CO ₂ gas	14.9	-	-	[3]
4	BiOCl	100	2 mL H ₂ O, CO ₂ gas	15.33	-	-	[4]
5	BiOCl	5	H ₂ O vapor, CO ₂ gas	14.51	-	-	[5]
6	BiOCl	50	100 mL H ₂ O, CO ₂ gas	188.2	-	-	[6]
7	BiOCl	20	50 mL H ₂ O, CO ₂ gas	21.4	-	-	[7]
8	BiOCl-SP	5	50 mL H ₂ O, CO ₂ gas	89.72	-	-	[8]
9	BiOCl-(Bi _{vac})	20	H ₂ O vapor, CO ₂ gas	21.99	-	-	[9]
10	BiOBr	10	H ₂ O vapor, CO ₂ gas	88.1	5.8	-	[10]
11	BiOBr	30	10 mL H ₂ O, 2.8 g NaHCO ₃ , 7 mL H ₂ SO ₄ (4mol/L)	4.55	7.1	-	[11]
12	BiOBr	30	50 mL H ₂ O, CO ₂ gas	20.1	-	-	[12]
13	BiOBr	10	H ₂ O vapor, CO ₂ gas	263.2	3.3	-	[13]
14	BiOBr	30	50 mL H ₂ O, CO ₂ gas	2.03	-	-	[14]
15	BiOIO ₃	20	1.7 g NaHCO ₃ , 15 mL, H ₂ SO ₄ (4mol/L)	17.33	~0.02	-	[15]
16	Bi ₂₄ O ₃₁ Cl ₁₀	50	5 mL H ₂ O, CO ₂ gas	0.9	-	-	[16]
17	Bi ₄ O ₅ Br ₂	50	5 mL H ₂ O, CO ₂ gas	3.16	0.5	-	[17]
18	Bi ₁₂ O ₁₇ Br ₂	30	50 mL H ₂ O, CO ₂ gas	34.5	-	-	[18]
19	Bi ₄ O ₅ Br ₂	20	H ₂ O vapor, CO ₂ gas	31.6	~0.15	-	[19]

BiOX photocatalysts tuned with extrinsic techniques for PCR

20	BiOBr/Bi ₂ S ₃	10	H ₂ O vapor, CO ₂ gas	100.8	8.5	-	[20]
21	BiOBr/NiO	20	10 mL water, 0.1 g NaHCO ₃ , 0.5 mL H ₂ SO ₄ (2 mol/L)	12.8	6.6		[21]
22	BiOBr/Cds	10	10 mL H ₂ O, CO ₂ gas	4.5	-	-	[22]
23	AgBr/BiOBr	10	H ₂ O vapor, CO ₂ gas	212.6	5.7	-	[23]
24	AgBr/BiOBr	15	10 mL H ₂ O, CO ₂ gas	12.43	-	-	[24]
25	BiOBr/CdS diethylenetriamine	50	10 mL H ₂ O, 0.12 g NaHCO ₃ , 0.5 mL H ₂ SO ₄ (2 mol/L)	19.4	-	-	[25]
26	CoPc/BiOBr	5	200 μ L H ₂ O, CO ₂ gas	59.9	-	-	[26]
27	CsPbBr ₃ QDs/BiOBr	8	30 mL ethyl acetate, 100 μ L H ₂ O, CO ₂ gas	26.1	2.5	-	[27]
28	CdS/BiOBr	20	100 mL NaOH (0.1 mol/L), CO ₂ gas	-	-	219	[28]

29	Bi-Cu ₃ SnS ₄ /BiOBr	50	300 W Xe lamp ($\lambda > 420$ nm)	50.13	-	-	[29]
30	BiOBr/g-C ₃ N ₄	20	100 mL NaOH (0.1 mol/L), CO ₂ gas	-	-	267	[30]
31	BiOBr/CoAl-LDH	15	10 mL H ₂ O, CO ₂ gas	4.1	4.2	-	[31]
32	BiOBr/Zn(OH) ₂	10	10 mL H ₂ O, CO ₂ gas	5.4	-	-	[32]
33	CdS/BiOCl	50	10 mL H ₂ O, CO ₂ gas	0.5	1.7	-	[33]
34	CsPbBr ₃ /BiOCl	8	30 mL ethyl acetate, 100 μ L H ₂ O, CO ₂ gas	34.72	3.47	-	[34]
35	g-C ₃ N ₄ /BiOCl	20	H ₂ O vapor, CO ₂ gas	4.7	0.8	-	[35]
36	CuO/BiOCl	50	15 mL H ₂ O, CO ₂ gas	-	114.1	36.2	[36]
37	BiOCl/Bi ₂ WO ₆	50	H ₂ O vapor, CO ₂ gas	0.5	1.7	-	[37]
38	WO _x /BiOCl	30	10 mL H ₂ O, CO ₂ gas	8.82	-	-	[38]
39	Bi ₄ O ₅ Br ₂ /AgBr	50	5 mL H ₂ O, CO ₂ gas	6.6	1.8	-	[39]
40	CPD/Bi ₄ O ₅ Br ₂	30	10 mL H ₂ O, CO ₂ gas	132.42	-	-	[40]
41	Bi ₃ O ₄ Cl/g-C ₃ N ₄	50	5 mL H ₂ O, CO ₂ gas	6.6	1.9	-	[41]
42	CdS@Bi ₂₄ O ₃₁ Br ₁₀	50	12 mL acetonitrile, 4 mL TEA, 4 mL H ₂ O, CO ₂ gas	5.8	-	-	[42]
43	BiOBr-(001)/Bi ₂ SiO ₅ /Bi	20	5 mL H ₂ O, CO ₂ gas	234.05	-	-	[43]
44	In ₂ O ₃ /BiOI	50	10% TEOA, CO ₂ gas	11.98	5.69	-	[44]
45	Bi ₂ MoO ₆ /BiOI	20	H ₂ O vapor, CO ₂ gas	8.34	3.31	-	[45]
46	Pt, N-co-doped BiOCl	20	100 mL NaOH (0.1 mol/L), CO ₂ gas	-	-	41.1	[46]
47	Ni-doped BiOBr	5	1 mL H ₂ O, 4 mL CH ₃ CN, 1 mL TEOA, 5 mg	378.7	-	-	[47]
48	Gd-doped BiOBr	100	60 mL H ₂ O, CO ₂ gas			41.24	[48]
49	C-doped Bi ₂₄ O ₃₁ Cl ₁₀	50	1.7 g NaHCO ₃ , 5 mL H ₂ SO ₄ (4mol/L)	2.54	~0.74	-	[49]
50	Fe-doped Bi ₅ O ₇ I	5	H ₂ O vapor, CO ₂ gas	12.02	-	-	[50]
51	Bi ₄ O ₅ Br ₂ /Fe-MIL	20	20 mL isopropanol, CO ₂ gas	-	7.96	-	[51]
52	Bi ₄ O ₅ I ₂ -Fe	50	5 mL H ₂ O, CO ₂ gas	23.77	4.98	-	[52]
53	B-doped BiOCl	50	100 mL H ₂ O, CO ₂ gas	83.64	-	-	[53]
54	PbBiO ₂ Br	20	10 mL H ₂ O, CO ₂ gas	4.58	-	-	[54]
55	Au@Bi ₁₂ O ₁₇ Br ₂	30	1 mL H ₂ O, CO ₂ gas	-	2.29	-	[55]
56	Au/BiOCl	50	3 mL H ₂ O, CO ₂ gas	3.46	1.39	-	[56]
57	Ag-loaded BiOBr	30	50 mL H ₂ O, CO ₂ gas	26.8	-	-	[57]
58	BiOBr _x Cl _{1-x}	10	H ₂ O vapor, CO ₂ gas	15.86	-	-	[58]

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