

Supplementary Information

Two-Dimensional Nanomaterials: Synthesis and Applications in Photothermal Catalysis

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Table S1. Comparison of the synthesis strategy of 2D nanomaterials.¹

Synthesis strategy		Merits	Drawbacks
Top-down methods	Mechanical exfoliation	high crystal qualities; smooth surfaces	low yields; smaller size; uncontrollable thickness
	Liquid exfoliation	Low cost; high efficiency; easy versatile and scalable	time-consuming; harsh environments; extreme conditions; environmental pollution; inhomogeneous thickness
Bottom-up methods	Chemical vapor deposition	large areas; high quality; large-scale preparation;	specific substrates; harsh reaction conditions; high energy consumption; high cost
	Wet-chemical synthesis	Easy operation; controllable morphology and crystal size; low energy consumption; good optical performance	harsh reaction conditions; low-quality with defects

Table S2. Photothermal applications of 2D nanomaterials and their composites.

Photothermal application	Materials	Temperature s (°C)	Light source	Ref.
CO ₂ reduction	In ₂ O _{3-x}	340	300 W Xe lamp	2
	Ru@FL-LDHs	350	300 W Xe lamp (~10 Suns)	3
	Cu ₂ O/G	250	300 W Xe lamp, 200 mW cm ⁻²	4
	Pt/H _x MoO _{3-y}	140	Xe lamp irradiation (λ > 450 nm)	5
	CoFe-650	310	300 W Xe light	6
	Ni/Nb ₂ C	402	300 W Xe arc lamp	7
VOCs oxidation	Au-Cu/g-C ₃ N ₄	120	300 W Xe lamp (λ > 420 nm)	8
	Cu-CO ₃ O ₄	207	Full solar spectrum with light of 834 mW cm ⁻²	9

	GO/MnO _x	80	300 W xenon lamp	10
	TiO ₂	290	Hg lamp	11
	GO/MnO _x /CN	~ 85	300 W Xe lamp	12
	Pt-rGO-TiO ₂	150	IR light irradiation, 116 mW/cm ²	13
	Pt-LDH/CeO ₂	160	Xenon lamp, 160 mW/cm ²	14
	Ni ₂ P/TiO ₂ (B)	90	300W Xe lamp	15
	SAAg-g-CN	55	300 W Xenon lamp	16
	Mo ₂ C/ZnIn ₂ S ₄	124.1	300 W Xe lamp, 100 mW/cm ²	17
	CS@ZIS@PS	43.4	300 W Xenon Lamp (λ > 420 nm)	18
H ₂ production	TiN-Pt	~50	Solar-simulated light (Sciencetech Light Line A4-C250)	19
	Cu/TiO ₂	90	300 W Xenon lamp (full-spectrum)	20
	NiS@g-C ₃ N ₄	56.7	300 W Xe lamp	21
	d-Ti ₃ C ₂ membrane	~39	300 W Xe lamp	22
	Ti ₃ C ₂ T _x /La _{0.5} Sr _{0.5} CoO ₃ (LSC)	40	350 W Xe lamp (λ > 420 nm)	23
	BiInSe ₃ @CF	50	Xe lamp	24
H ₂ O purification	hierarchical graphene foam	114.8	Solar simulator (SAN-EI ELECTRIC XES-160S1)	25
	BPQDs	~55	808 nm laser, 1 W/cm ²	26

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