Supplementary Information

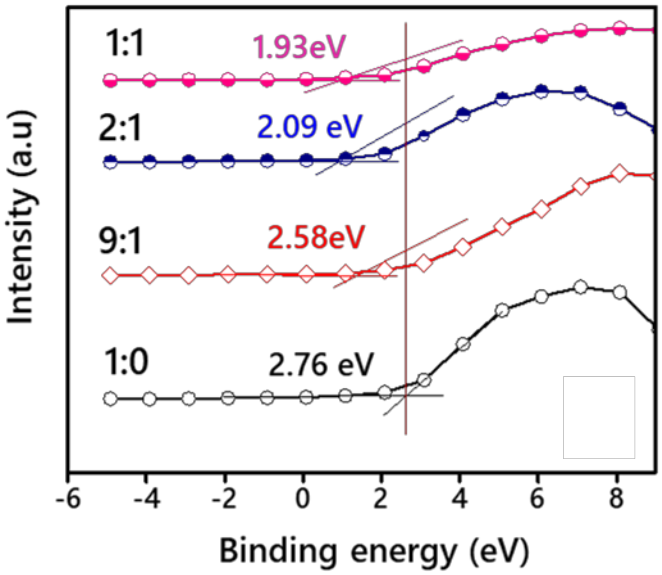

Fig. S1 Valence band XPS spectra of the synthesized photocatalysts.

Table S1 Summary of synthesis methods for core-shell structure TiO_2 and the corresponding performance for the degradation of organic pollutants (Nawaz et al., 2022).

Synthesis method	Color	Target pollutant	Initial concentration (mg/L)	Time (min)	Light	Efficiency (%)	Ref.
Al-Reduction	Black & blue	Methyl orange	20	8	Solar	100	(Wang et al., 2015)
Solvothermal	Yellow	Rhodamine B	30	5	Visible	70.0	(Bi et al., 2020)
Hydrogenation	Blue	Methyl orange	NM	8	Solar	100	(Zhu et al., 2016)
Solvothermal	Blue	Rhodamine B	10	120	Visible	74.2	(Zhou et al., 2016)
Hydrogen plasma	Black	Phenol	1.88	180	Visible	99	(Han et al., 2016)
Evaporation	Black	4-chlorophenol	10	60	Visible	99	(Hossain et al., 2015)
Hydrogen plasma	Gray	Phenol	10	120	Visible	89.2	(Zhang et al., 2020)

Notes: NM, not mentioned.

Table S2 Characteristics of the TPOME used in the current study.

Parameters	Units	Values
Temperature	℃	26
pH	–	7.6
BOD	mg/L	250
COD	mg/L	870
Suspended solids	mg/L	150
Total solids	mg/L	2430
Total nitrogen	mg/L	13.0
Phenols	mg/L as GAE	224.85
Color	Pt.Co	2400
Oil and grease	mg/L	5.2

Notes: Values other than phenols, COD, color, and pH have been sourced from (Alhaji et al., 2017).

Table S3 Comparison of the phenolic compounds removal efficiency from TPOME by CSBT based photocatalysis and other processes.

Process	Initial concentration (mg/L)	Removal efficiency (%)	Ref.
Photocatalysis	224.85	48.30	This work
	224.85	78.32	(Nawaz et al., 2020b)
	224.85	71.20	(Nawaz et al., 2020a)
	224.85	39.11	(Nawaz et al., 2021)
	224.85	60.12	(Irfan et al., 2021)
	224.85	90.73	(Nawaz et al., 2022)
Enzymatic	NM	88.69	(Chaijak et al., 2018)
Anaerobic digestion	112	60.00	(Khongkhaem et al., 2016)
	33	64.40	(Tosu et al., 2015)
	475	82.2	(Kietkwanboot et al., 2015)

Table S4 Comparison of the remediation efficiency of TPOME using by different photocatalysts.

Process	Material used	Initial conc. (mg/L)		Removal (%)			Ref.
		PCs	COD	PCs	COD	Color	
Photocatalysis	Mn/BTiO$_2$	224.85	870	86.04	88.87	62.76	This work
	CS-black TiO$_2$	224.85	870	70.20	78.65		(Nawaz et al., 2022)
	Black TiO$_2$	224.85	870	~48%	–		(Nawaz et al., 2019)
	Mn/TiO$_2$	224.85	870	39.11			(Nawaz et al., 2021)
	Fe$_2$Cl$_3$	–	240	–	56	69	(Charles and Cheng, 2019)
	Ag/TiO$_2$	–	700	–	16	–	(Cheng et al., 2016)
	TiO$_2$	–	250	–	52.53	–	(Ng et al., 2020)
	Pt/TiO$_2$	–	700	–	10	–	(Cheng et al., 2015)
Fenton		–	120–638	–	82.00	66.50	(Kongnoo et al., 2012)
Enzymatic		NM	–	88.69	–	–	(Chaijak et al., 2018)
Anaerobic digestion		112	–	60.00	–	–	(Khongkhaem et al., 2016)
		33	–	64.40	–	–	(Tosu et al., 2015)
		475	–	82.2	–	–	(Kietkwanboot et al., 2015)

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