Supporting information

Highly efficient removal of organic pollutants by ultrahigh-surface-area-ethynylbenzene-based conjugated microporous polymers via adsorption-photocatalysis synergy

Junhui Wang[†], Huangsheng Yang[†], Long Jiang[†], Shuqin Liu[†], Zhengping Hao[‡], Jie Cheng[‡*], Gangfeng Ouyang[†*]

[†] MOE Key Laboratory of Bioinorganic and Synthetic Chemistry, School of Chemistry, Sun Yat-Sen University, No. 135, Xingang Xi Road, Guangzhou, Guangdong, 510275, China

[‡] National Engineering Laboratory for VOCs Pollution Control Material & Technology, University of Chinese Academy of Sciences, Beijing, 100049, China

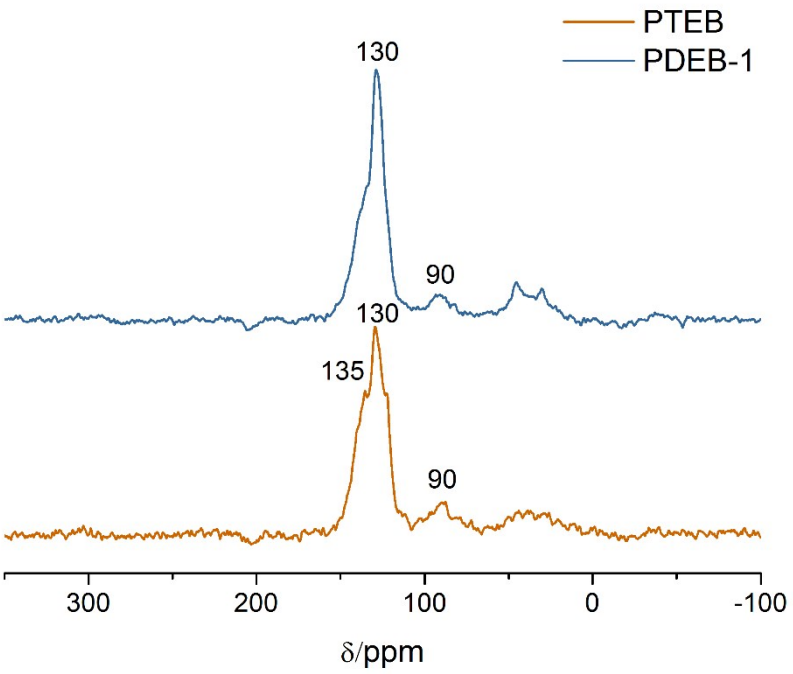

Figure S1. Solid-state NMR spectra for PTEB and PDEB-1.

Table S1. Elemental analysis and ICP-MS results of the catalysts.

Sample	C (wt.%)	H (wt.%)	Pd (wt.%)
PTEB	93.71	4.55	0.0383
PDEB-1	93.68	4.28	0.0257
PDEB-2	93.83	4.94	0.0932

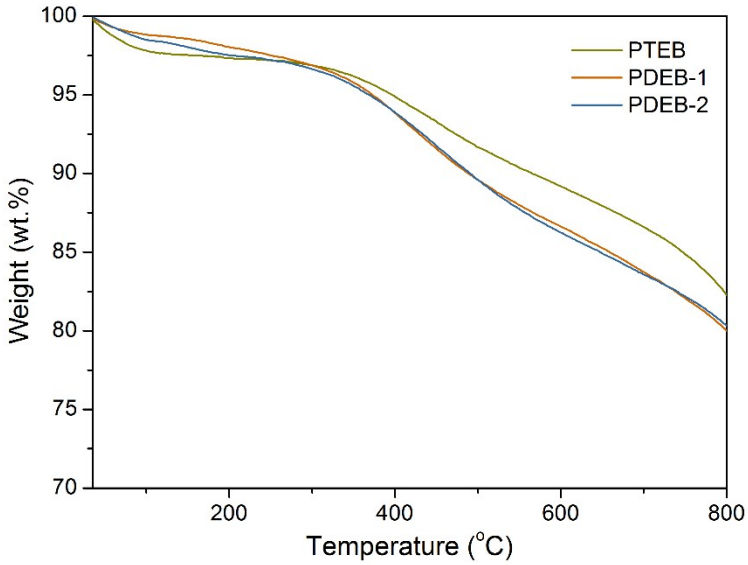

Figure S2. Thermogravimetric curves for PTEB, PDEB-1 and PDEB-2 materials

Table S2. The pseudo-first-order and pseudo-second-order parameters and the correlation coefficients (R^2) of the adsorption kinetic models.

Materials	Pseudo-first-order model			Pseudo-second-order model		
	k_1	$q_{e,1}$	R^2	k_2	$q_{e,2}$	R^2
PTEB	0.102	200	0.999	3.890	173	0.858
PDEB-1	0.076	196	0.991	2.210	156	0.782
PDEB-2	0.022	104	0.943	0.00094	79	0.493

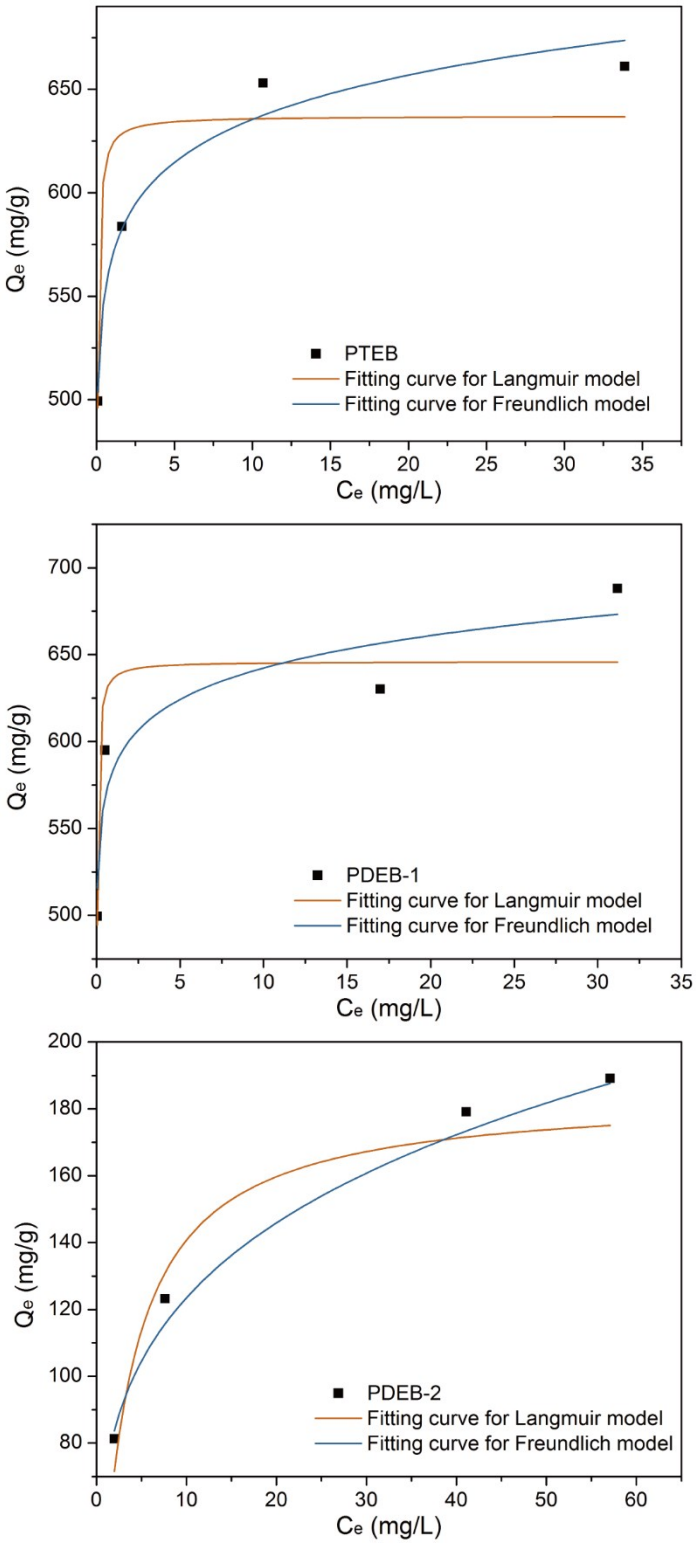

Figure S3. The fitting curves of Langmuir and Freundlich model for the adsorption isotherms of RhB on the polymers.

Table S3. The constants of Langmuir and Freundlich isotherms for RhB adsorption on the three polymers at 25 °C.

Materials	Langmuir model			Freundlich model		
	q_m	b	R^2	K	n	R^2
PTEB	637	45	0.742	569	21	0.962
PDEB-1	646	66	0.754	583	24	0.845
PDEB-2	185	0.32	0.853	71	4.2	0.955

To prove the elution process is effective to elute all the RhB adsorbed on the photocatalysts:

5 mg of PDEB-1 was dispersed in 50 mL of RhB solution (20 mg/L) and stirred until RhB was totally adsorbed (the UV-Vis Absorbance of the supernatant is zero). After been kept still for 2 days, most of the water was removed and then the residue (catalyst and little water) was dried at 100 °C under vacuum for 24 h. After then, 50 mL of methanol was added and mixed with the dried catalyst, and treated by ultrasound under 50 °C for 30 min. The eluent of RhB from the catalyst was tested by the UV-Vis.

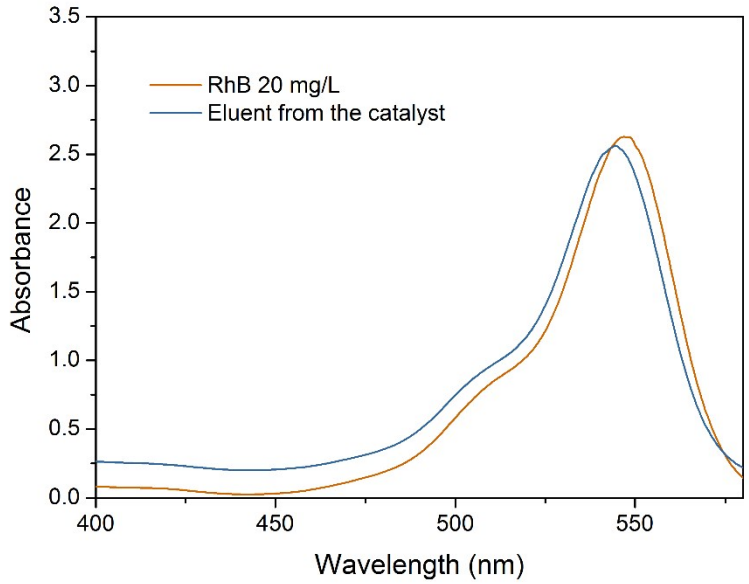

Figure S4. UV-Vis spectra of the RhB solution (20 mg/L) and the eluent from the catalyst.

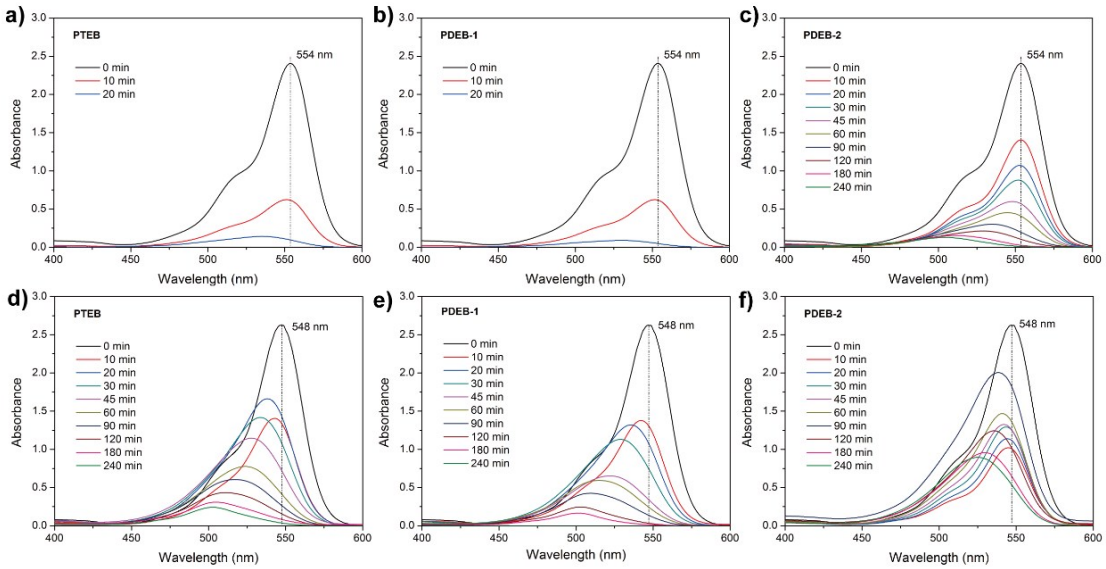

Figure S5. Temporal UV-Vis absorption spectral changes for the RhB solution (supernatant: a-c; eluent: d-f) as a function of irradiation time photocatalysized by three conjugated polymers

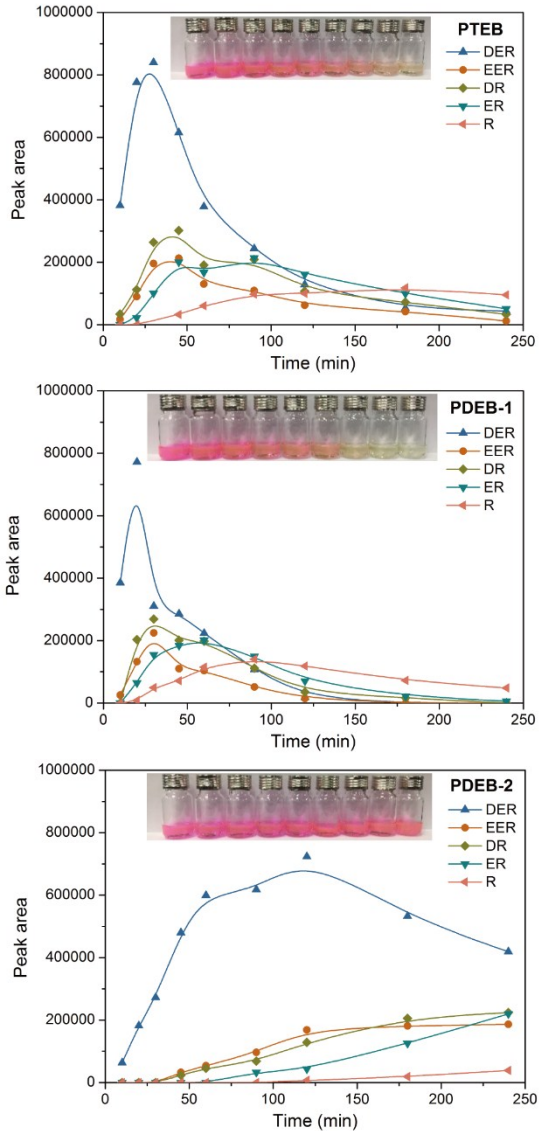

Figure S6. Variations in the distribution of the intermediate products in the corresponding eluents.

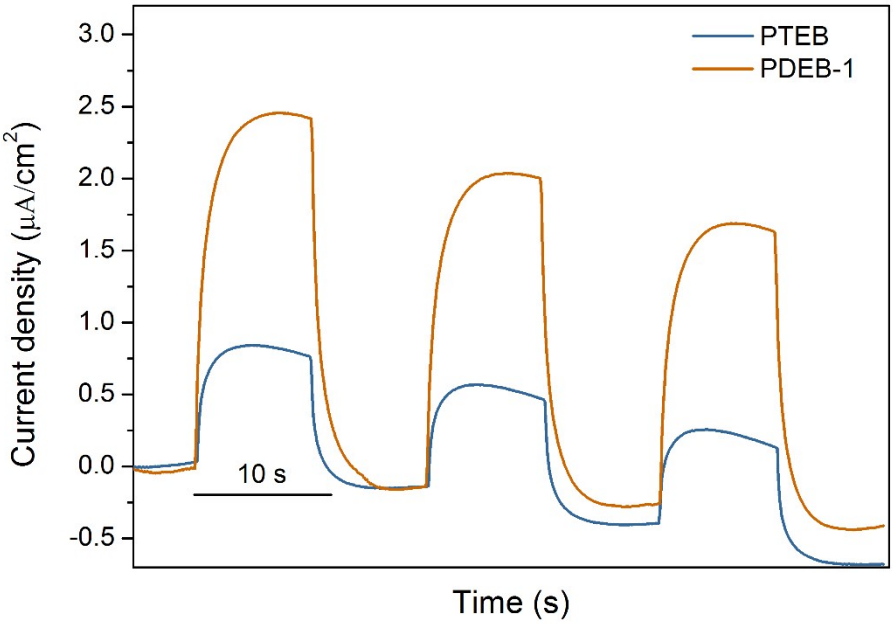

Figure S7. The photocurrent generated by PTEB and PDEB-1 under visible light.

Table S4. Comparison of the photocatalytic performance of the various reported photocatalysts and PDEB-1 towards RhB under visible light

Materials	$C_{catalyst}$ (mg/L) [a]	C_{RhB} (mg/L)	Treating time (min)	Removal ratio	Removal rate (h^{-1})[b]	Ref.
PDEB-1	100	20	20	98%	0.588	This work
Py-BF-CMP	200	75	40	95%	0.534	1
g-C_3N_4/Nb_2O_5	1000	10	90	80%	0.005	2
BiOI@$Bi_{12}O_{17}Cl_2$	1000	10	300	100%	0.002	3
PANI/TiO_2	500	10	100	97%	0.012	4
PNNs	150	10	80	100%	0.050	5
TiO_2/In_2O_3	1000	10	180	90%	0.003	6
N-CQDs/BiOBr	200	10	50	100%	0.060	7
CPNB/FCF	250	4.8	180	90%	0.006	8
Ag_2O/BiOCOOH	300	6	60	100%	0.020	9

[a] The ratio of the mass of the catalyst and the volume of the RhB solution.

[b] The amount of RhB degraded per hour per unit mass of catalyst.

[1] B. Wang, Z. Xie, Y. Li, Z. Yang, L. Chen, Macromolecules 51 (2018) 3443-3449.

[2] G.T.S.T. da Silva, K.T.G. Carvalho, O.F. Lopes, C. Ribeiro, Appl. Catal. B 216 (2017) 70-79.

[3] H. Huang, K. Xiao, Y. He, T. Zhang, F. Dong, X. Du, Y. Zhang, Appl. Catal. B 199 (2016) 75-86.

[4] H. Zhang, R.L. Zong, J.C. Zhao, Y.F. Zhu, Environ. Sci. Technol. 42 (2008) 3803-3807.

[5] L. Zhang, X.H. Huang, J.S. Hu, J. Song, I. Kim, Langmuir 33 (2017) 1867-1871.

[6] C. Li, T. Ming, J. Wang, J. Wang, J.C. Yu, S.-h. Yu, J. Catal. 310 (2014) 84-90.

[7] J. Di, J. Xia, M. Ji, B. Wang, X. Li, Q. Zhang, Z. Chen, H. Li, ACS Sustain. Chem. Eng. 4 (2016) 136-146.

[8] X.X. Xu, H.Y. Yang, Z.Y. Li, X.X. Liu, X.L. Wang, Chem. Eur. J. 21 (2015) 3821-3830.

[9] S. Li, K. Xu, S. Hu, W. Jiang, J. Zhang, J. Liu, L. Zhang, Appl. Surf. Sci. 397 (2017) 95-103.