Electronic Supplementary Material (ESI) for Materials Chemistry Frontiers.

Supporting Information

Ultrathin 2D Cu-porphyrin MOF nanosheets as heterogeneous catalysts for styrene oxidation

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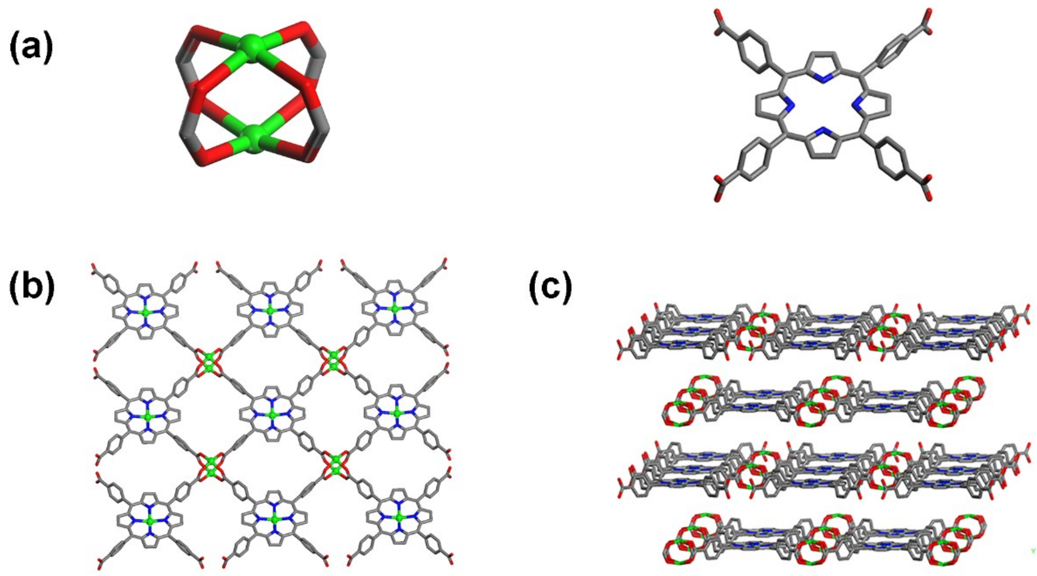


Fig. S1 (a) Building units of Cu-TCPP, Cu $(COO)_4$ paddlewheel (left), and TCPP (right) (C-gray, N-blue, O-red, Cu-green); (b) One layer of Cu-TCPP; (c) The layered structure of Cu-TCPP with AB stacking.

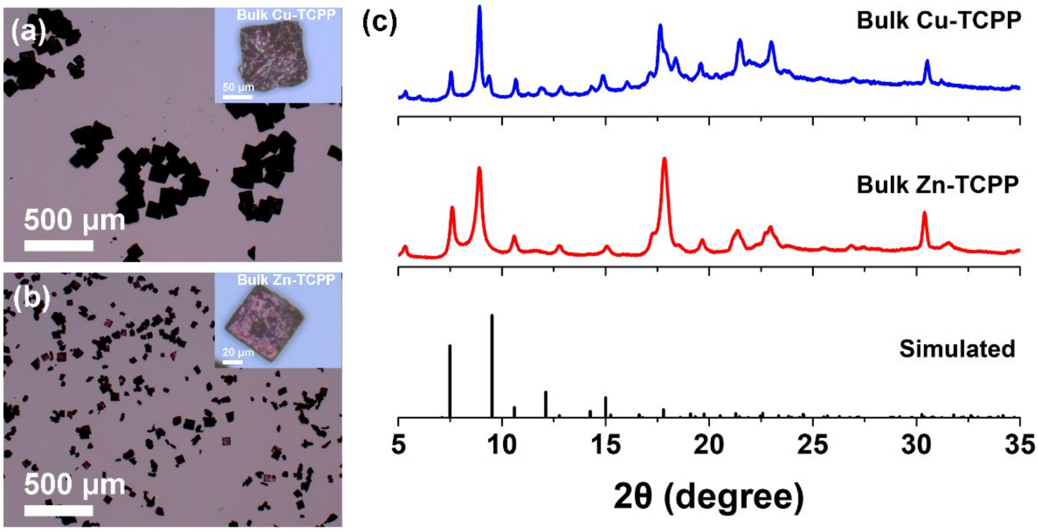


Fig. S2 (a-b) Optical images of bulk Cu-TCPP and bulk Zn-TCPP; (c) XRD patterns of bulk Cu-TCPP and Zn-TCPP.

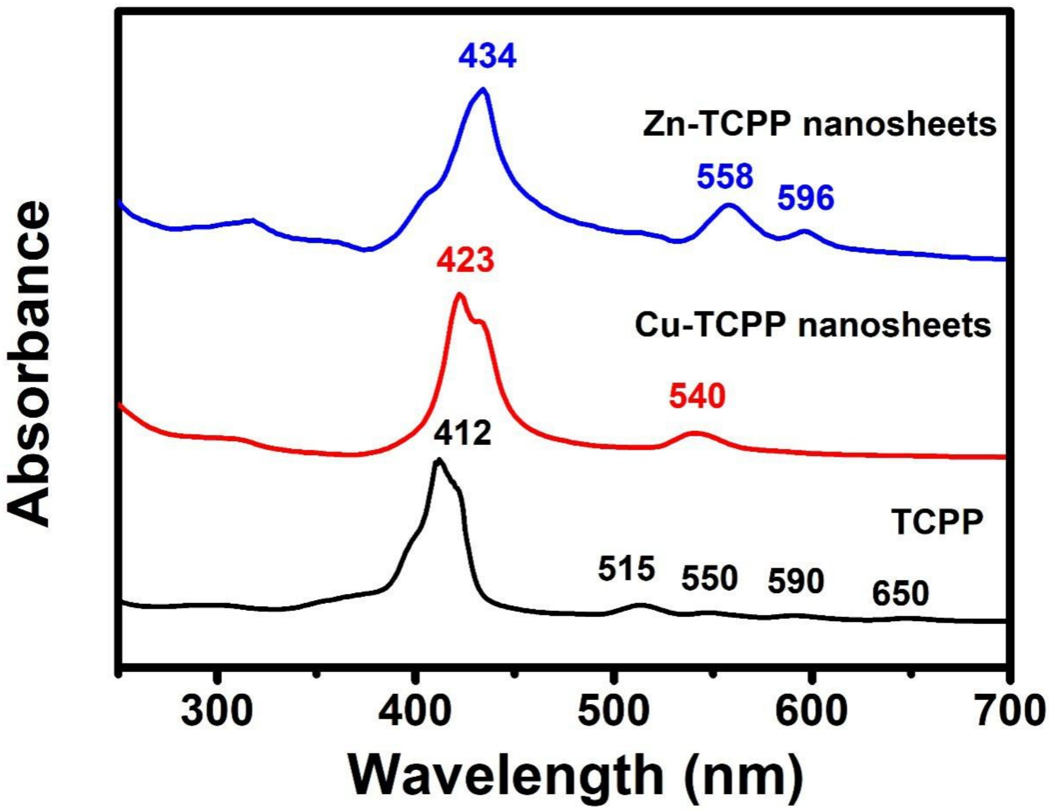


Fig. S3 UV-vis spectra of TCPP, Cu-TCPP nanosheets and Zn-TCPP nanosheets.

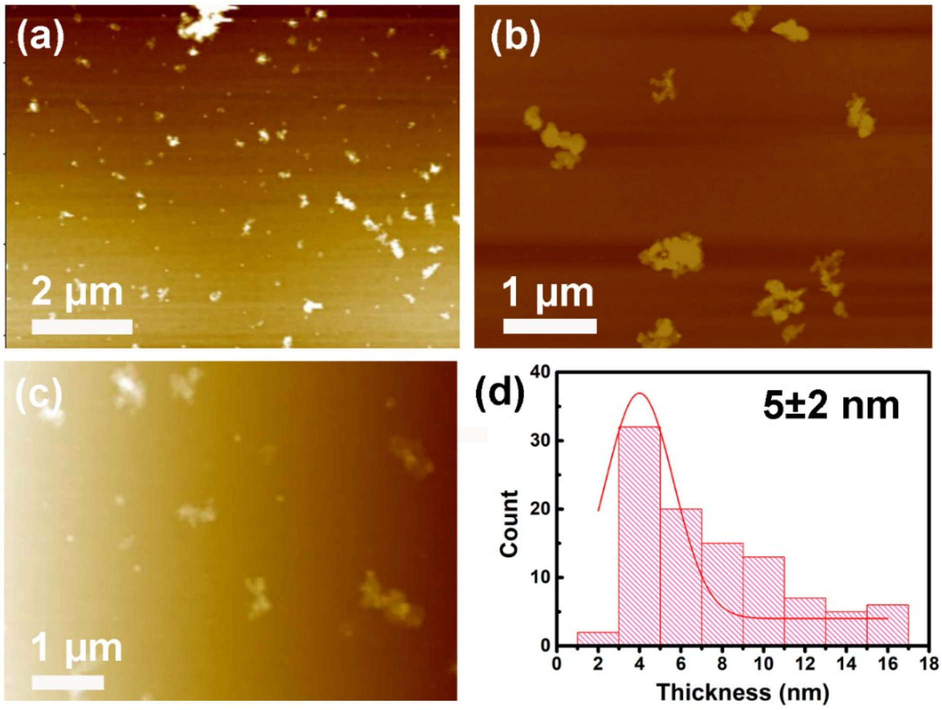


Fig. S4 (a-c) AFM images of Cu-TCPP nanosheets; (d) Statistical analysis of the thickness of ~100 Cu-TCPP nanosheets measured in AFM images.

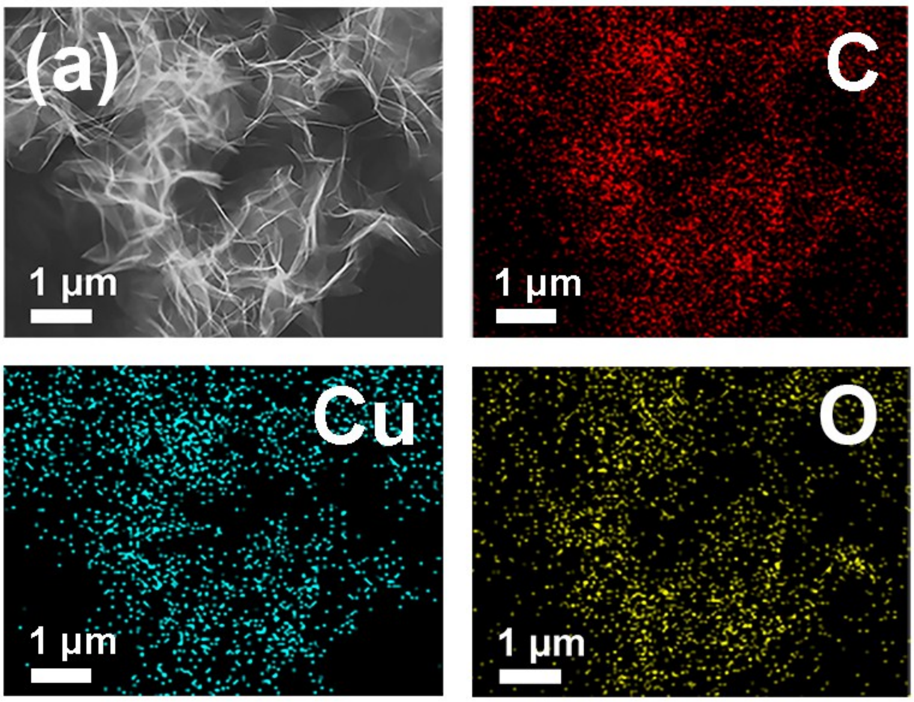


Fig. S5 (a) Elemental mapping of Cu-TCPP showing copper, carbon, and oxygen.

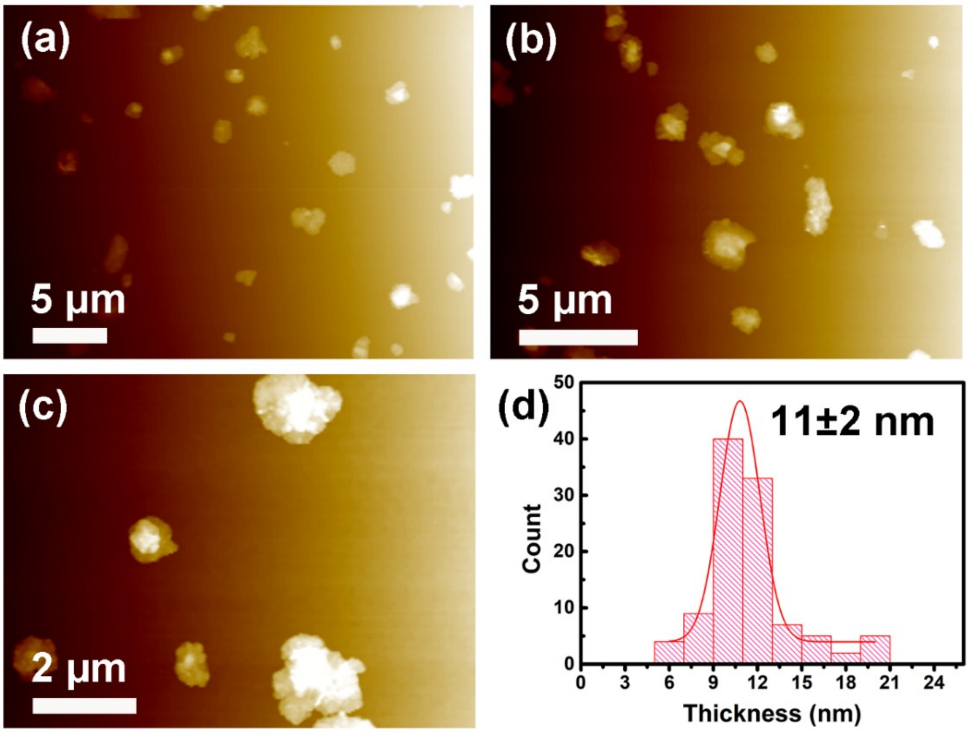


Fig. S6 (a-c) AFM images of Zn-TCPP nanosheets; (d) Statistical analysis of the thickness of ~100 Zn-TCPP nanosheets measured in AFM images.

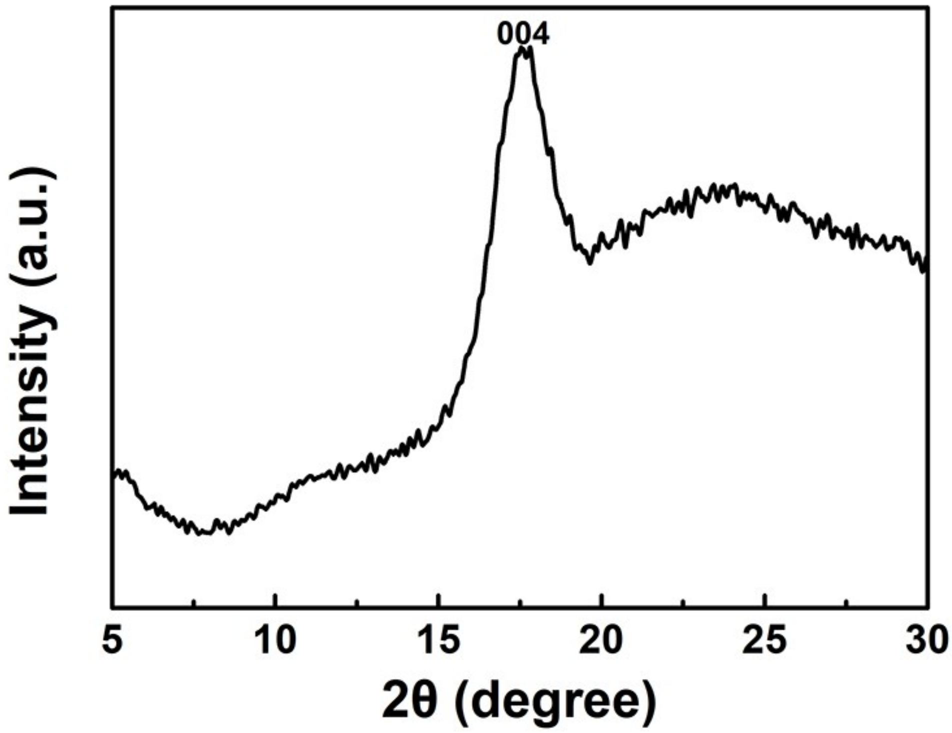


Fig. S7 XRD pattern of Zn-TCPP nanosheets.

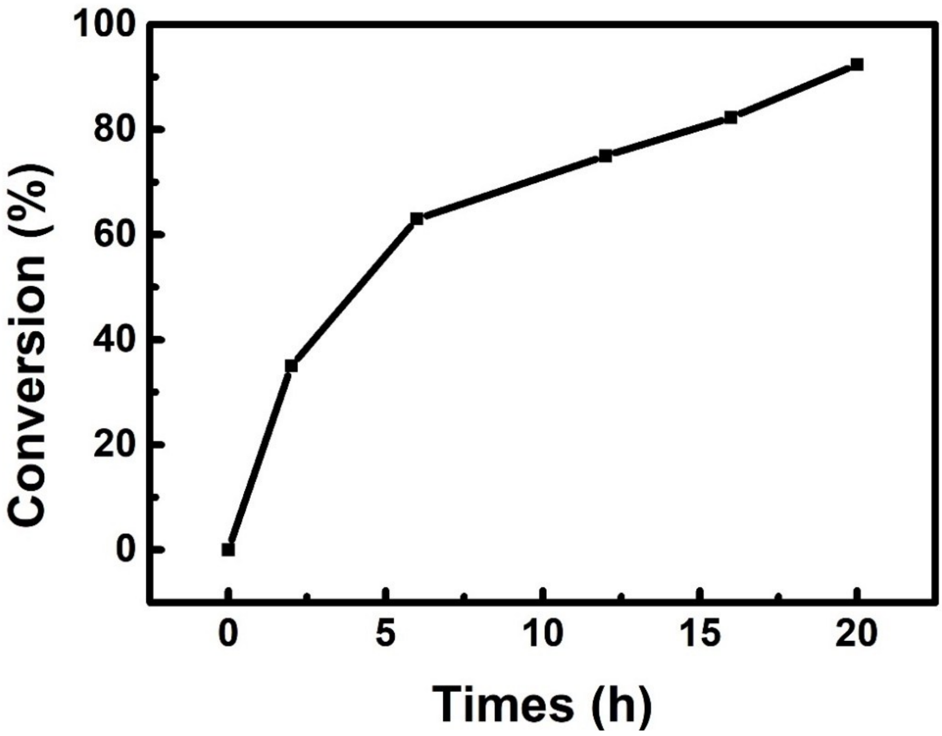


Fig. S8 Conversion efficiency of styrene versus time of Cu-TCPP nanosheets.

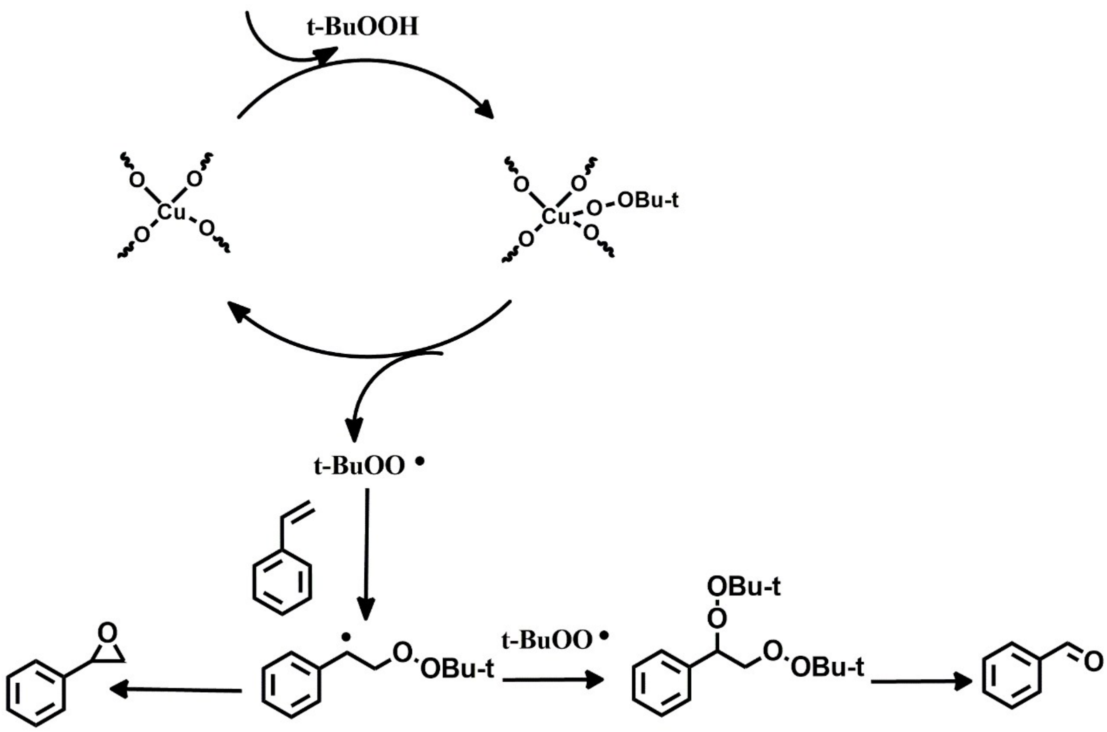


Fig. S9 Catalytic process of styrene oxidation [1, 2].

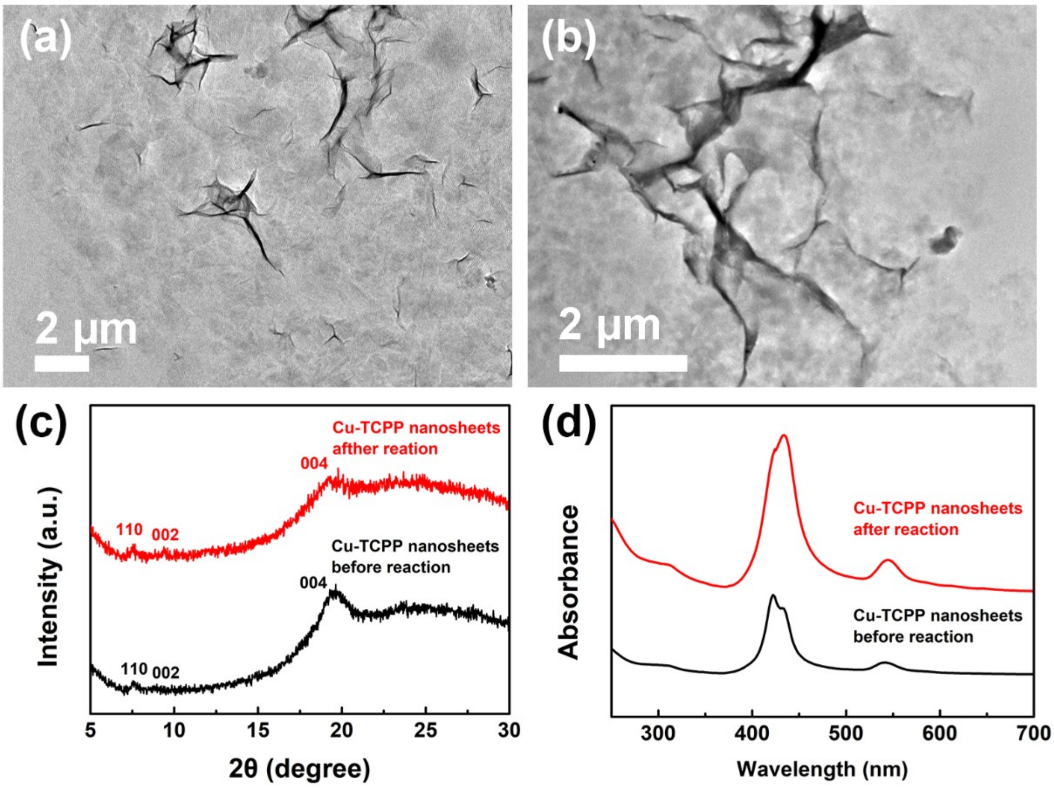


Fig. S10 TEM images of Cu-TCPP nanosheets before (a) and after (b) the reaction; XRD patterns (c) and UV-vis spectra (d) of Cu-TCPP nanosheets before and after reaction.

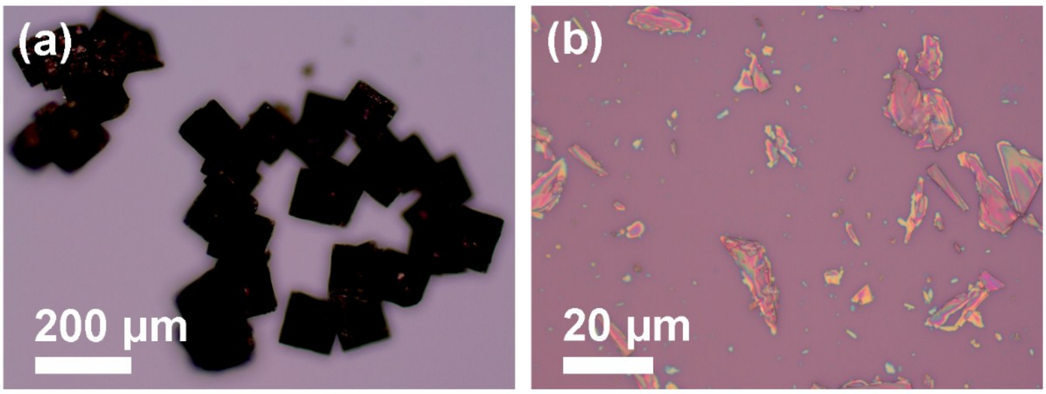


Fig. S11 Optical microscope images of bulk Cu-TCPP crystals before (a) and after (b) the reaction.

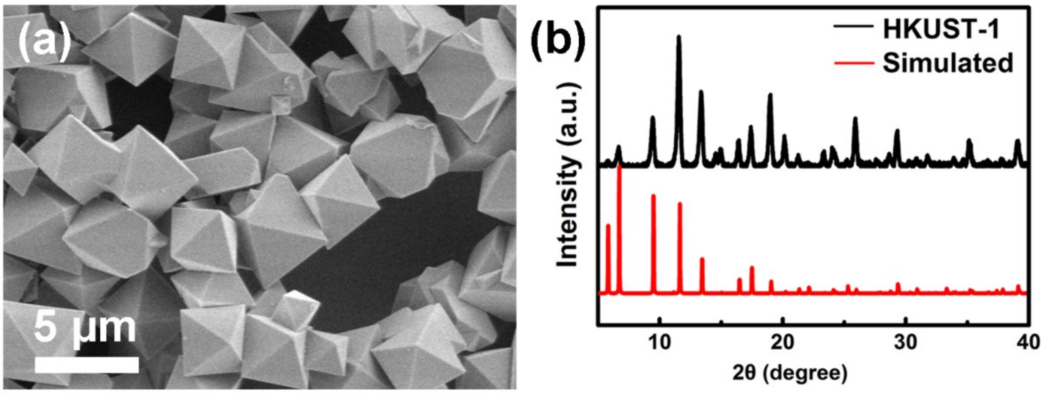
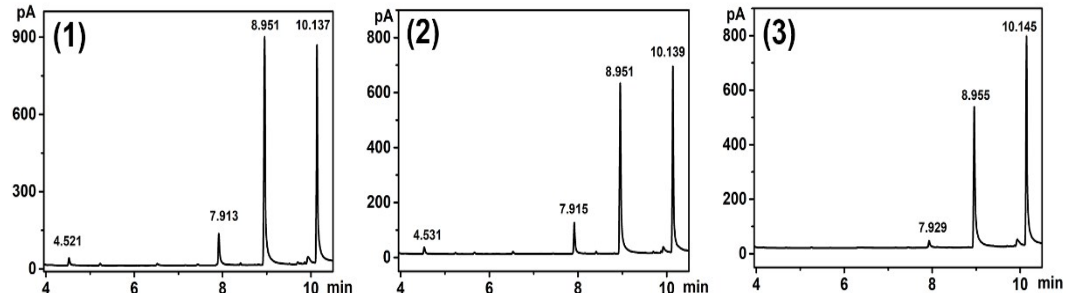


Fig. S12 (a) SEM image of HKUST-1; (b) XRD pattern of HKUST-1.

1. P. Cancino, V. Paredes-Garcia, P. Aguirre and E. Spodine, *Catal. Sci. Tech.*, 2014, **4**, 2599-2607.
2. H.-F. Yao, Y. Yang, H. Liu, F.-G. Xi and E.-Q. Gao, *J. Mol. Catal. A: Chem.*, 2014, **394**, 57-65.

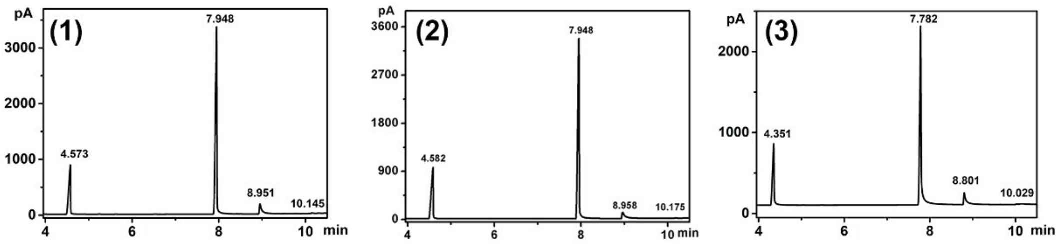
Some original gas chromatography results:

Styrene oxidation: Cu-TCPP nanosheets



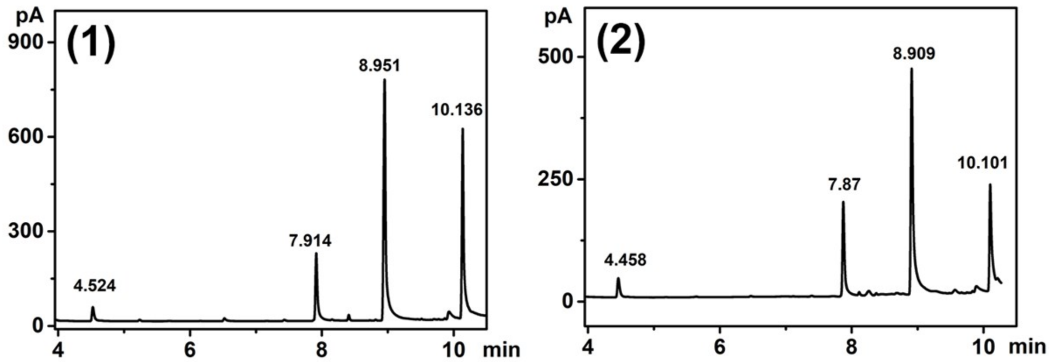
Materials	Time (min)	Area
	1/2/3	1/2/3
Styrene	7.913/7.915/7.929	344.8/283.4/74.0
Benzaldehyde	8.951/8.951/8.955	2300.2/1610.6/1553.4
Styrene oxide	10.137/10.139/10.145	1924.9/1482.6/1832.8

Styrene oxidation: Zn-TCPP nanosheets



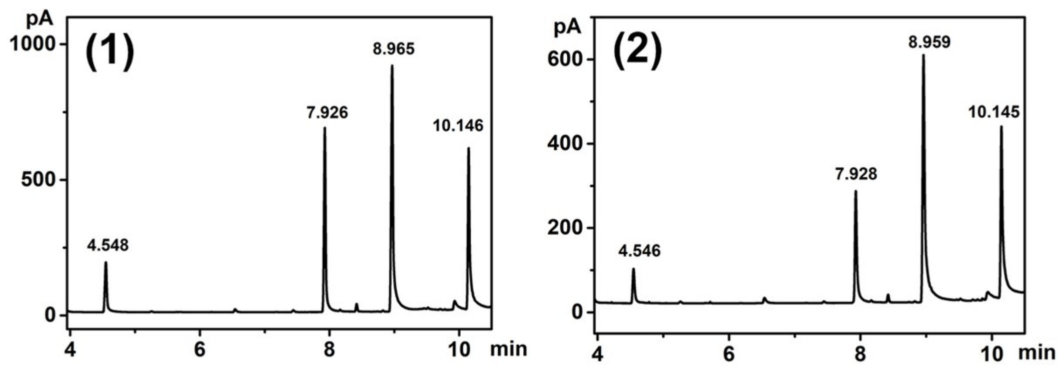
Materials	Time (min)	Area
	1/2/3	1/2/3
Styrene	7.948/7.948/7.782	8354.7/8315.6/5599.4
Benzaldehyde	8.951/8.958/8.801	781.1/689.6/644.1
Styrene oxide	10.145/10.175/10.029	36.7/20.2/12.4

Styrene oxidation: Bulk Cu-TCPP



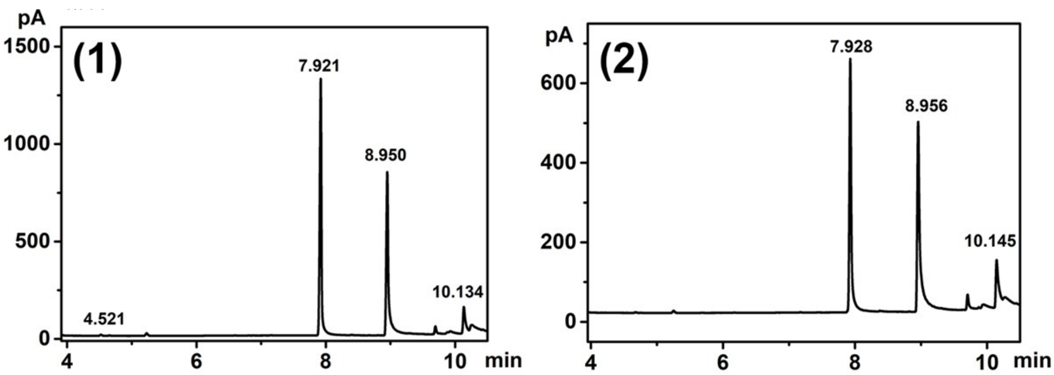
Materials	Time (min)	Area
	1/2	1/2
Styrene	7.914/7.87	525.5/459.8
Benzaldehyde	8.951/8.909	1978.9/1277.9
Styrene oxide	10.136/10.101	1422.3/615.7

Styrene oxidation: HKUST-1



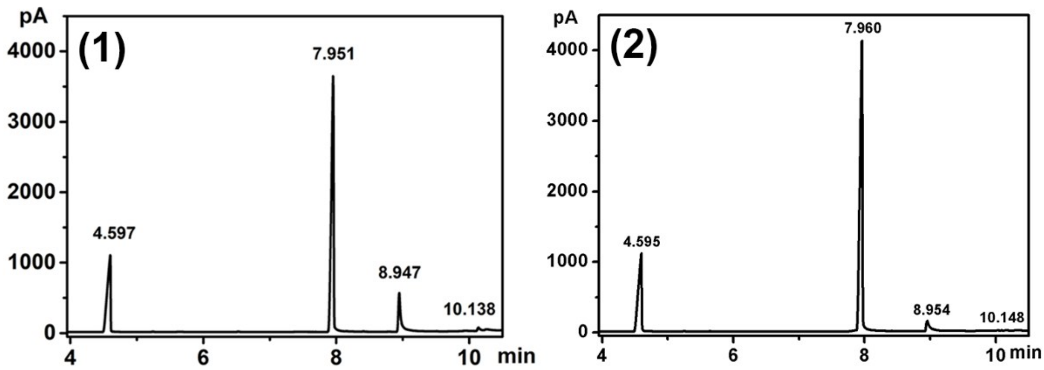
Materials	Time (min)	Area
	1/2	1/2
Styrene	7.926/7.928	1328.1/672.6
Benzaldehyde	8.965/8.959	2210.6/1890.0
Styrene oxide	10.146/10.145	1461.2/1422.2

Styrene oxidation: Cu^{2+}



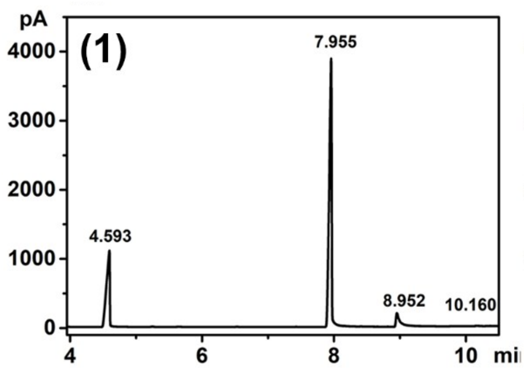
Materials	Time (min) 1/2	Area 1/2
Styrene	7.921/7.928	2575.2/1335.8
Benzaldehyde	8.950/8.956	2130.2/1510.6
Styrene oxide	10.134/10.145	365.4/416.5

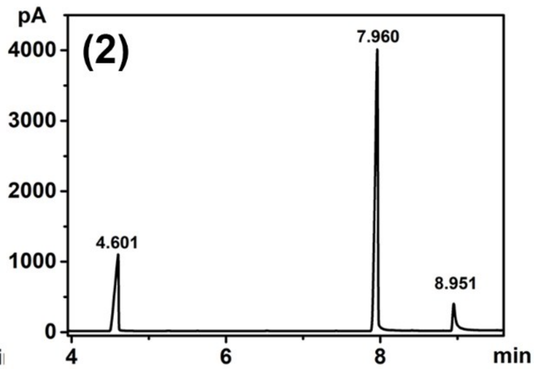
Styrene oxidation: TCPP



Materials	Time (min) 1/2	Area 1/2
Styrene	7.921/7.960	8996.9/11199.7
Benzaldehyde	8.947/8.954	1680.8/674.2
Styrene oxide	10.138/10.148	139.2/44.7

Styrene oxidation: None





Materials	Time (min) 1/2	Area 1/2
Styrene	7.955/7.960	10107.8/10390.5
Benzaldehyde	8.952/8.951	985.2/1326.5
Styrene oxide	10.160/	28.2/0