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Supplementary Information

Hierarchical porous HPW/titania–silica material with superior adsorption-catalytic oxidation activity for multi-ring thiophenic sulfur compounds

The preparation of macroporous template

Monodispersed polystyrene spheres (PS) with the diameter of 350 nm were synthesized by emulsifier-free emulsion polymerization technique without adding surfactant and used as macroporous template. The typical preparation process of monodispersed PS was prepared as follows: 16 mL styrene (2M NaOH solution was used to remove the inhibitor, then washed by distilled water to pH = 7) and 240 mL distilled water were added to 500 mL of the round-bottomed flask and kept at 70 °C under nitrogen atmosphere. Then, 0.28 g of $k_2S_2O_8$ was added under vigorous stirring, the reaction was kept at 70 °C for 6 h. The PS colloidal crystal template was dried in oven at 60 °C and crushed to powder. According to macroporous template usage, certain amount of PS powder was dispersed in ethanol in an ultrasonic bath.



Fig.S1 The DBT removal of HPW@80SiO₂-TiO₂ and hierarchical $80SiO_2$ -TiO₂ catalysts with time; Reaction conditions: catalyst dosage = 0.03 g, T = 30°C, O/S = 4

Catalyst	$m_{(TEOS)}/g$	m _(TBOT) /g	
HPW@TiO ₂	0	2.833	
HPW@10SiO ₂ -TiO ₂	0.231	2.550	
HPW@20SiO ₂ -TiO ₂	0.462	2.267	
HPW@30SiO ₂ -TiO ₂	0.694	1.983	
HPW@40SiO ₂ -TiO ₂	0.924	1.700	
HPW@50SiO ₂ -TiO ₂	1.157	1.416	
HPW@60SiO ₂ -TiO ₂	1.386	1.133	
HPW@70SiO ₂ -TiO ₂	1.617	0.850	
HPW@80SiO ₂ -TiO ₂	1.851	0.567	
HPW@90SiO ₂ -TiO ₂	2.079	0.283	
HPW@SiO ₂	2.31	0	

Table S1 The usage of TEOS and TBOT

Entry	Catalyst	Substrate	Catalyst usage	O/S	Temperature	Conversion
			(g)		(°C)	(%)
1[1]	meso/macroporpus HPW/SiO ₂	DBT	0.05	4:1	60	>99
2[2]	meso/macroporpus HPW/SiO ₂	DBT	0.1	12:1	60	>99
3[3]	meso/macroporpus HPW/TiO ₂	DBT	0.05	4:1	60	>99
4[4]	mesoporpus HPMo/SiO ₂	DBT	0.05	3:1	70	>99
5[5]	[Bmim] ₃ PMo ₁₂ O ₄₀ /SiO 2	DBT	0.1	3:1	60	>88
6[6]	mesoporpus HPW/HMS	DBT	0.2	8:1	60	>99
7[7]	mesoporpus HPW-TiO ₂ -SiO ₂	DBT	0.2	12:1	70	>99
8[8]	mesoporpus HPW/TiO ₂	DBT	0.2	12:1	60	>95
9[9]	mesoporpus HPW-Al ₂ O ₃ -SiO ₂	BT	0.2	2:1	60	>99
10[10]	meso/macroporpus	DBT	0.05	4:1	30	>99
	$H_3PW_{12}O_{40}/T_1O_2$		0.05	4:1	40	>99
11[11]	$\frac{meso/macroporpus}{H_3PW_{12}O_{40}/SiO_2}$	DBT	0.1	4:1	30	>99
This work	HPW@80SiO2-TiO2	DBT	0.03	4:1	30	>99

Table S2 The ODS activity of supported catalyst reported in recent years

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