Supporting Information

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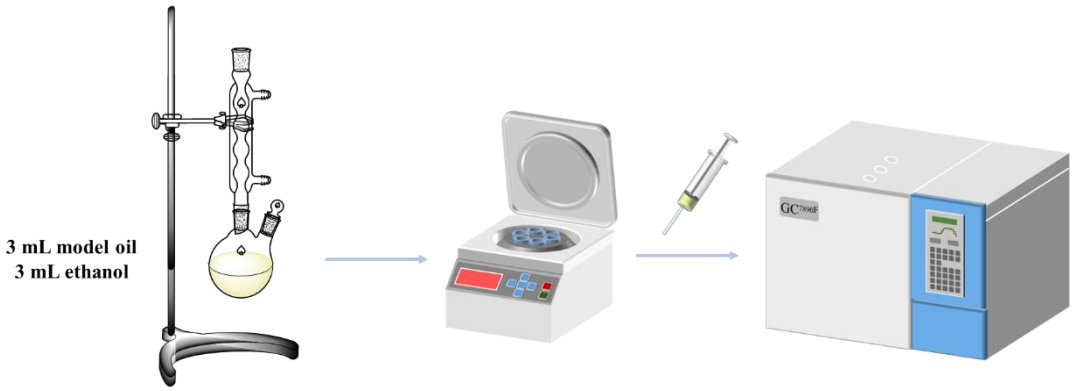

Fig. S1 ODS experimental device diagram

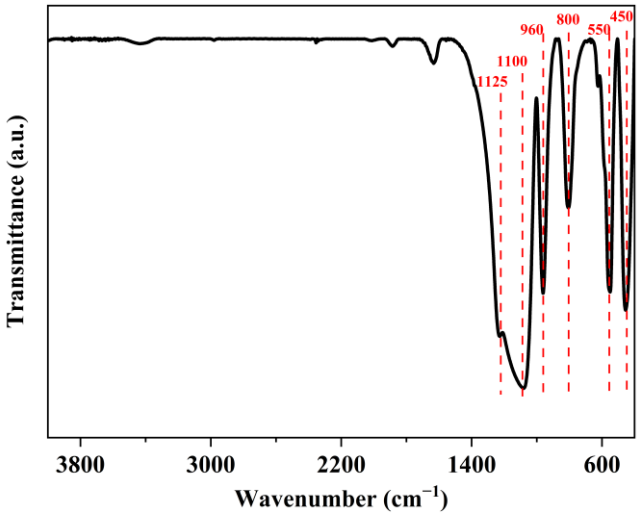

Fig. S2 FT-IR spectra of HPW/TS-1@TiO_2-0.05

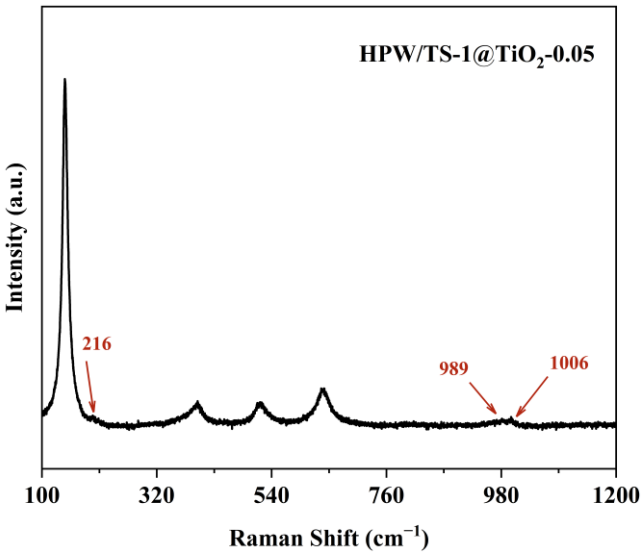

Fig. S3 Raman spectra of HPW/TS-1@TiO_2-0.05

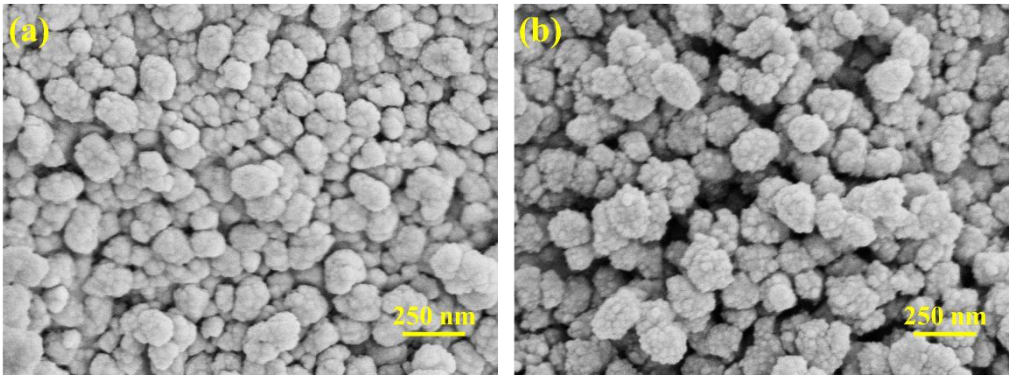

Fig. S4 Scanning electron micrographs of (a)TS-1@TiO_2-0.025 and (b) TS-1@TiO_2-1

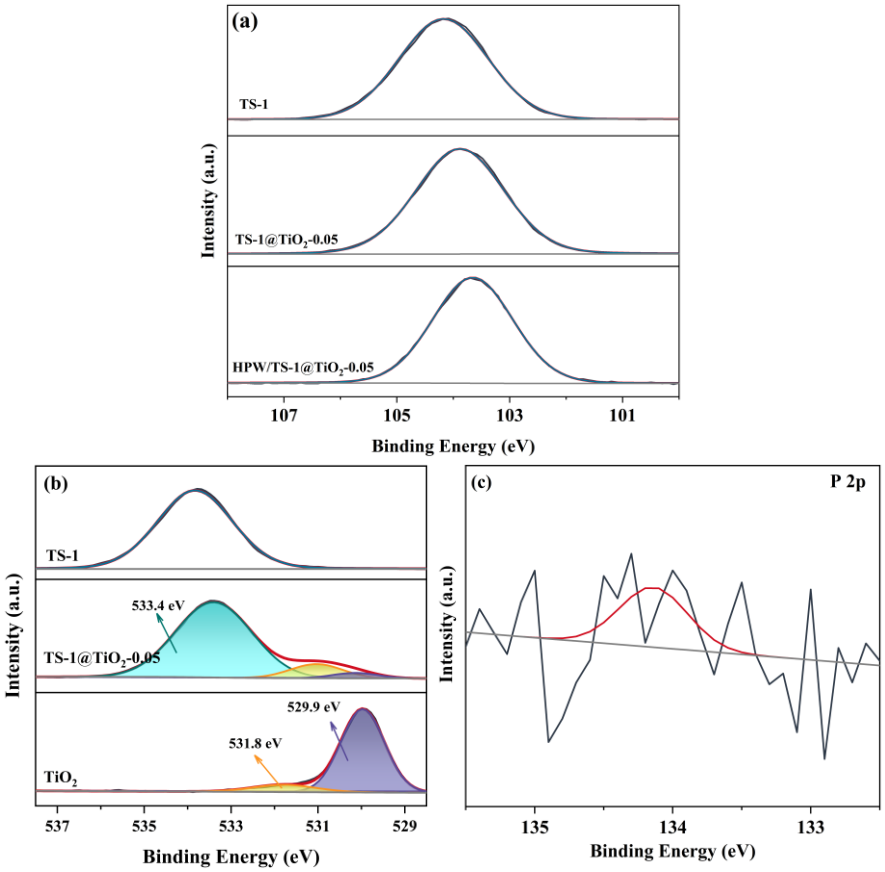

Fig. S5 XPS spectra of samples: (a) Si 2p, (b) O 1s and (c) P 2p

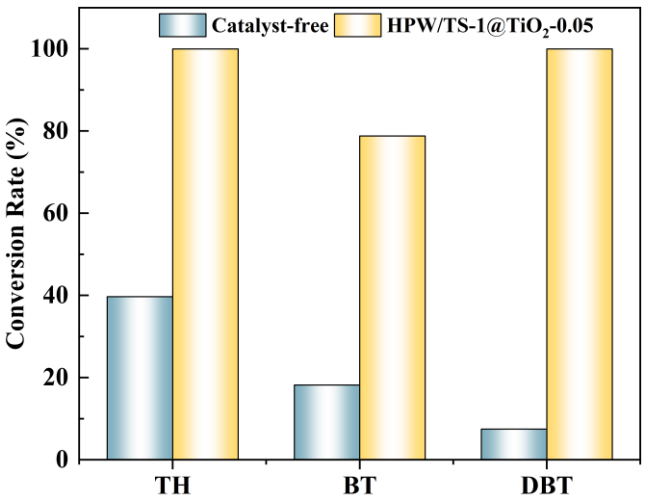

Fig. S6 The ODS performance on different sulfides using HPW/TS-1@TiO_2-0.05 and catalyst-free. Reaction conditions: *t* = 90 min, T = 60 °C, HPW/TS-1@TiO_2-0.05 dosage = 0.06 g, O/S molar ratio = 12.

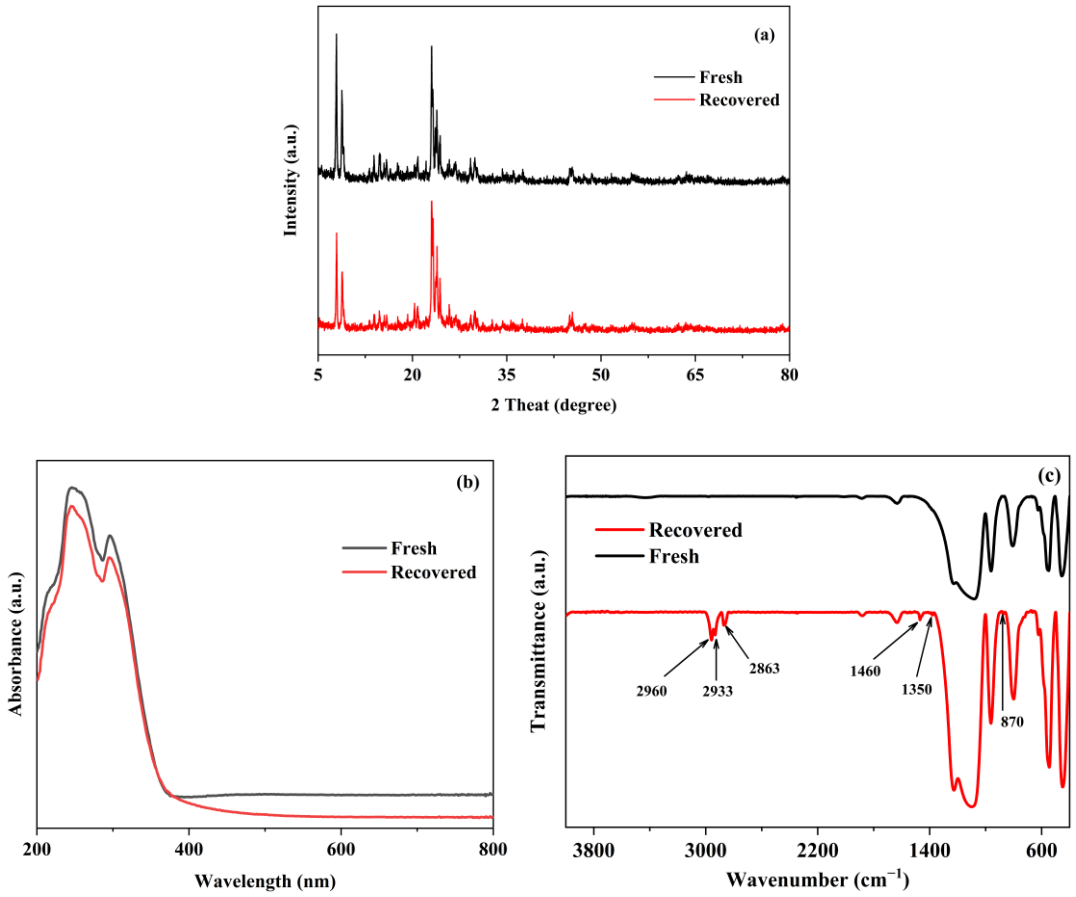

Fig. S7 XRD pattern (a) UV–vis spectra (b) and FT-IR spectra (c) of the recovered HPW/TS-1@TiO_2-0.05

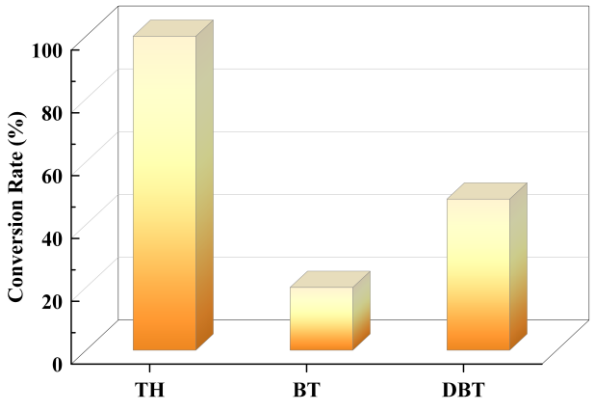

Fig. S8 ODS efficiencies on different sulfides over TS-1 catalyst.

Reaction conditions: *t* = 120 min, T=70 °C, TS-1 dosage = 0.06 g, O/S molar ratio = 12.

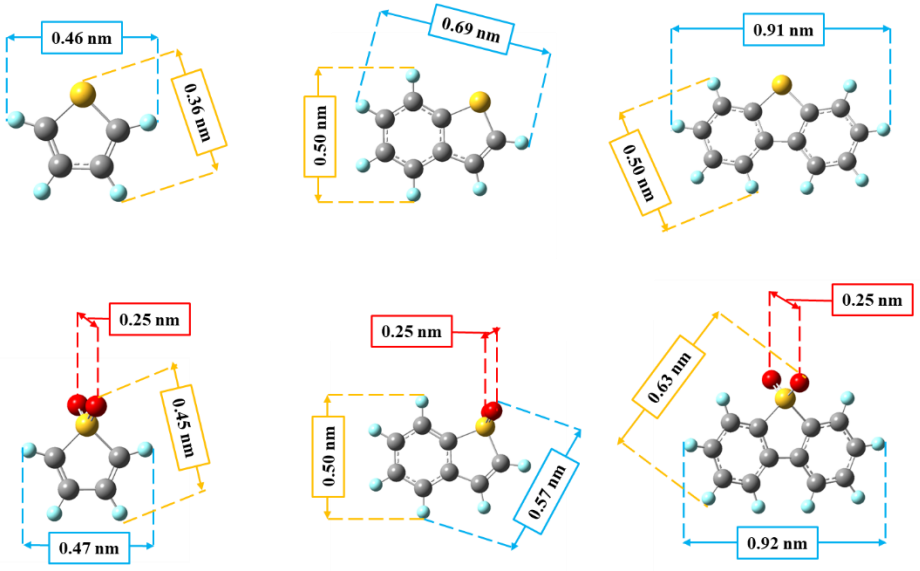

Fig. S9 Ball and stick models of TH, BT, DBT and corresponding sulphone.

Blue: H, Yellow: S, Gray: C and Red: O.

Table S1 Comparison of the reaction data with other reported methods

Catalysts	Model oil	Solvent	Reaction conditions	Conversion of TH	Conversion of BT	Conversion of DBT	Ref
TS-1	*n*-octane	H_2O	$C_{Cat.}$ = 10 g/L *T* = 60 ºC *t* = 30 min *n* (H_2O_2/ sulfur) = 4:1	97%	—	—	20
Hierarchical TS-1	*n*-octane	CH_3OH	$C_{Cat.}$ = 10 g/L *T* = 60 ºC *t* = 120 min *n* (H_2O_2/ sulfur) = 4:1	81%	69%	—	24
TiO_2	*n*-octane	CH_3OH	$C_{Cat.}$= 6.7 g/L *T* = 60 ºC *t* = 60 min *n* (H_2O_2/ sulfur) = 4:1	—	—	99.6%	36
TiO_2/GC	*n*-octane	—	$C_{Cat.}$ = 20 g/L *T* = 50 ºC *t* = 60 min *n* (H_2O_2/ sulfur) = 4:1	—	—	100%	31
$H_3PW_{12}O_{40}$	*n*-octane	CH_3CN	$C_{Cat.}$ = 70 g/L *T* = 60 ºC *t* = 60 min *n* (H_2O_2/ sulfur) = 2:1	—	—	99.2%	78
HPMoV$_2$/ TS-1-TPAOH@ SiO_2-in situ	*n*-octane	C_2H_5OH	$C_{Cat.}$ = 20 g/L *T* = 70 ºC *t* = 180 min *n* (H_2O_2/ sulfur) = 13:1	99.3%	45.9%	84.1%	52
HPW/ TS-1@ TiO_2-0.05	*n*-octane	C_2H_5OH	$C_{Cat.}$ = 20 g/L *T* = 60 ºC *t* = 90 min *n* (H_2O_2/ sulfur) = 12:1	99.9%	78.8%	99.9%	This work