Supplementary material

Enhanced Photocatalytic Desulfurization: Unlocking the Power of Anderson-type Polyoxometalate-Boosted (001) TiO_2 Nanodisks by Deep Eutectic Solvents

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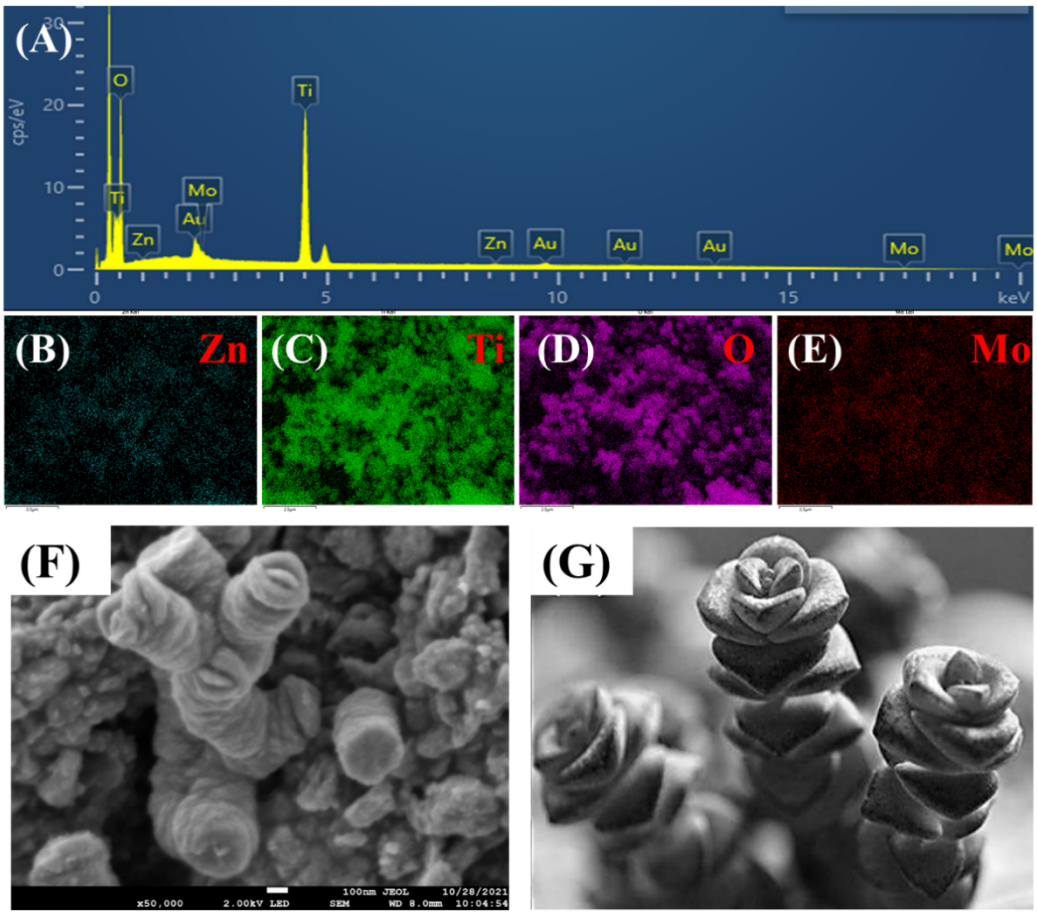


Figure S1. EDX-mapping images of $ZnMo_6$/DTO (A-E). SEM spectra of catalyst with HBD and HBA is 1:1 (F) and morphology of Cassula perforata plants (G).

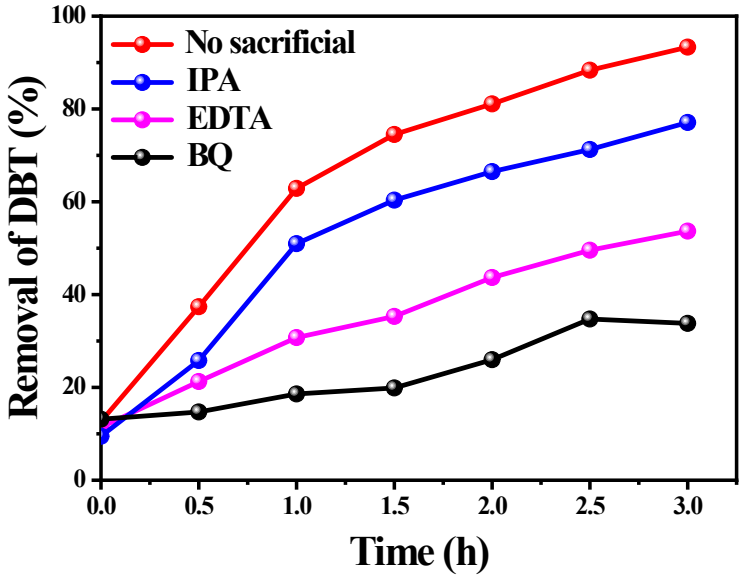


Figure S2 Capture experiments of $ZnMo_6$/DTO.

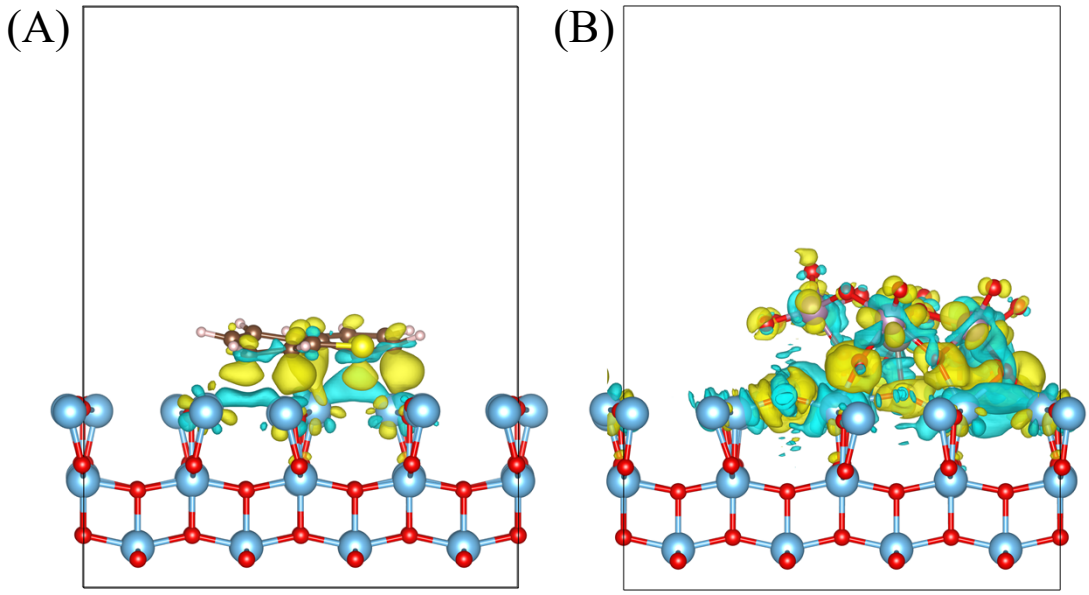


Figure S3 Charge transfer onto DTO with DBT and $ZnMo_6$/DTO.

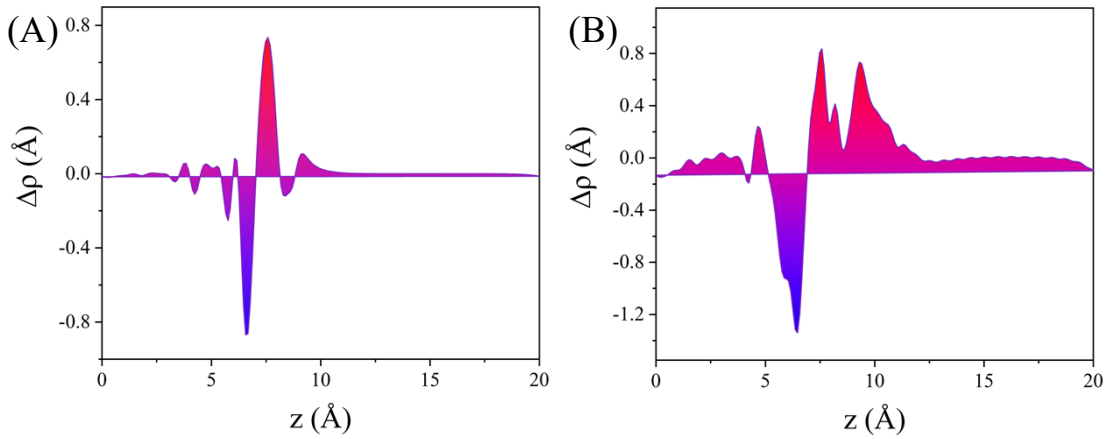


Figure S4 charge density difference plot of DTO with DBT and $ZnMo_6$/DTO.

Table S1. Important proprietary terms and abbreviations.

Key Abbreviations	Full Name
DESs	deep eutectic solvents
POM	polyoxometalate
DBT	dibenzothiophene
$ZnMo_6$/DTO	$(NH_4)_4H_6ZnMo_6O_{24}$ modified TiO_2 with DESs as solvents
DFT	Density Functional Theory
HDS	hydrodesulfurization
ODS	oxidative desulfurization
PODS	Photocatalytic oxidative desulfurization
ChCl	choline chloride
HBA	hydrogen bond acceptor
OA	oxalic acid
HBD	hydrogen bond donor
TBOT	Tetrabutyl titanate
BT	1-benzothiophene
4,6-DMDBT	4,6-dimethyldibenzothiophene
GA	glutaric acid
EG	ethylene glycol
TBACl	tetrabutylammonium chloride
ClChCl	chlorocholine chloride
AcChCl	acetylcholine chloride
BQ	p-Benzoquinone
IPA	isopropanol
EDTA	ethylenediaminetetraacetic acid
CB	conduction band
VB	valence band

Table S2. Energy consumption of different equipment.

Equipment	Power (W)	Time (s)	Energy consumption (kJ)
Drying Oven	850	129600	110160
High-Speed Centrifuge	400	360	144
Heated Magnetic Stirrer	530	14400	7632
Magnetic Stirrer	15	3600	54

Energy consumption per gram of catalyst: $P = \frac{110160 + 144 + 7632 + 54}{3600} = 32.8$ W/h

Fig. S5 (A) Fresh DES; (B) mixture after reaction; (A) DES used after washing with H_2O.

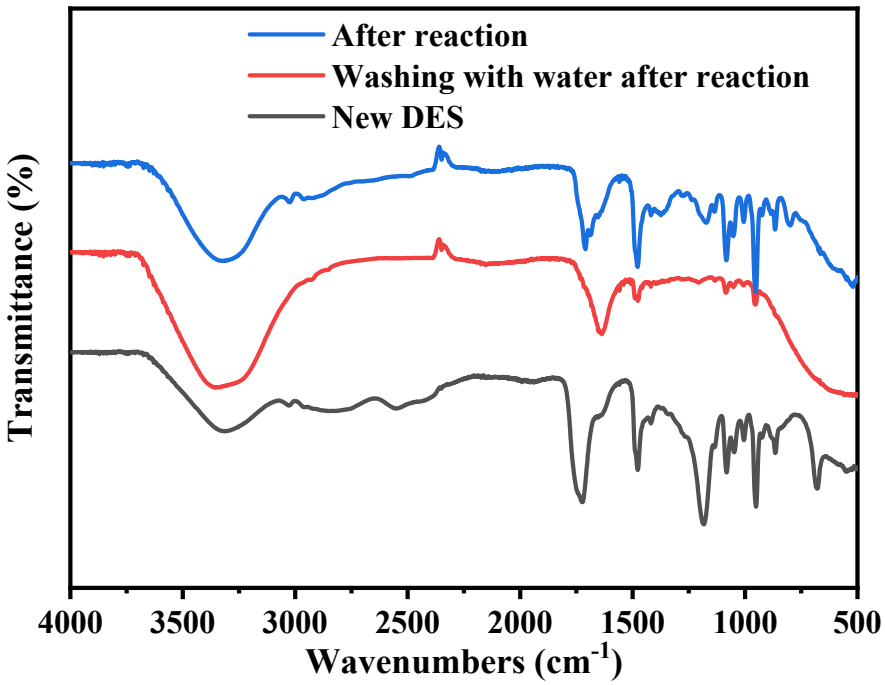
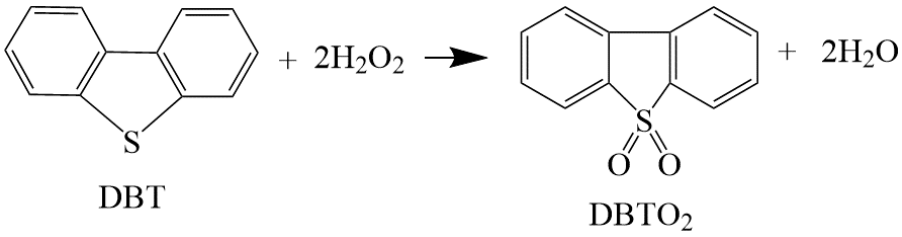


Fig. S6 FTIR of fresh DES, mixture after reaction and DES used after washing with H_2O.



M_{DBT}=184.2 g/mol，M_{DBTO_2}=216.2 g/mol，$M_{H_2O_2}$=34 g/mol

$$AU = \frac{216.2}{184.2+2*34} * 100\% = 85.7\%$$

Fig. S7 Reaction equation of DBT oxidation with H_2O_2 and atomic utilization calculation.