Supporting Information

New insights into ultra-deep oxidative desulfurization in the presence of competing molecules over alumina-supported vanadium-promoted tungsten oxide catalyst

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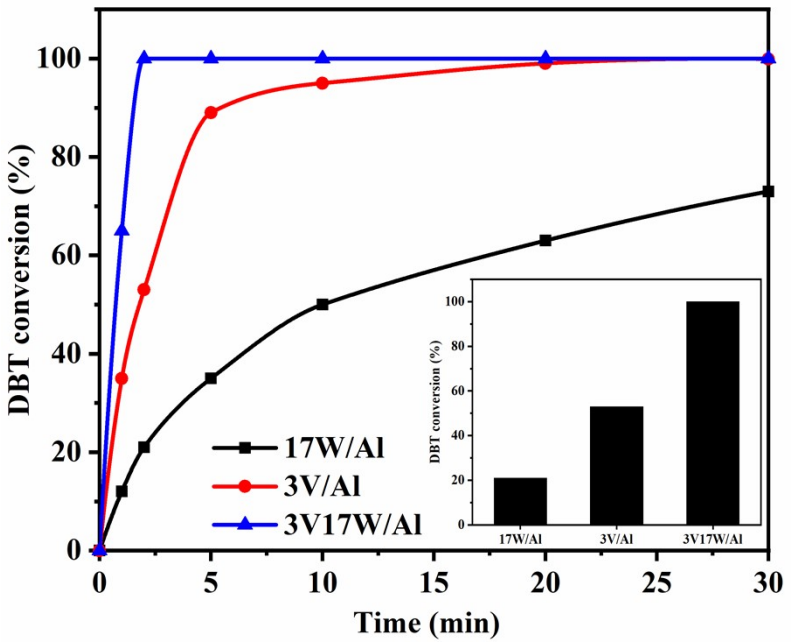

Fig. S1. Comparison of the catalytic performance of mono-metallic catalysts (3V/Al and 17W/Al) and the bimetallic catalyst (3V17W/Al). Reaction conditions: 3.0 g of model fuel (500 ppmw S in *n*-hexadecane), 0.03 g catalyst, reaction temperature: 353K, and TBHP/DBT molar ratio: 5.0.

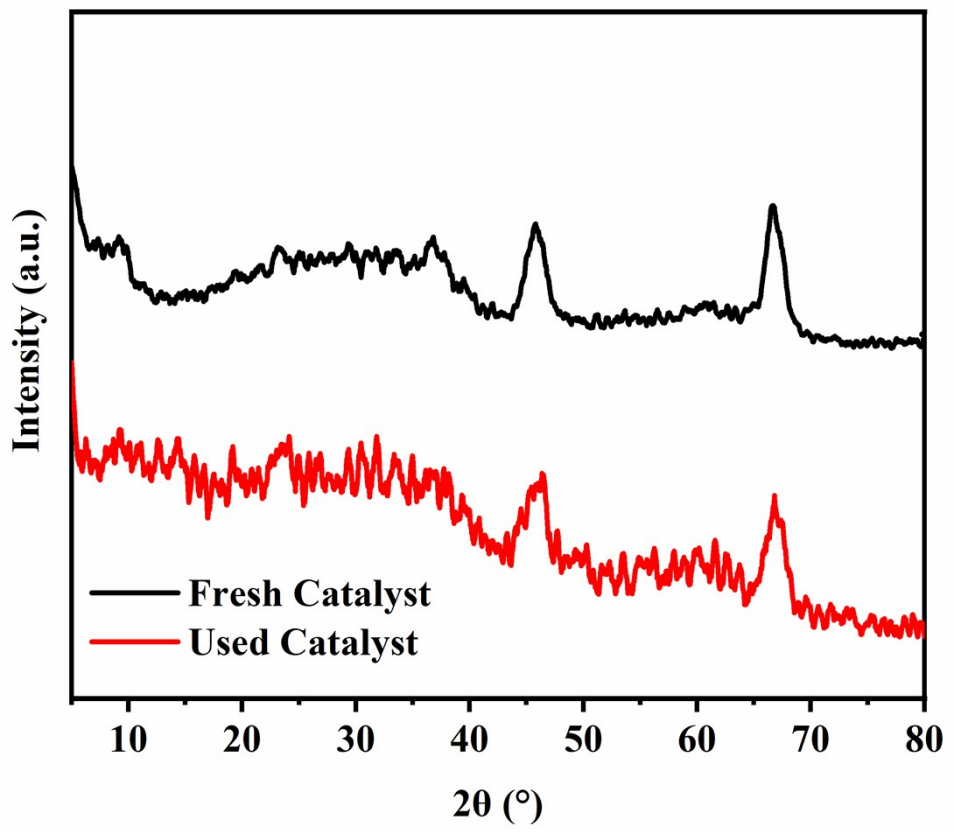

Fig. S2. Comparison between XRD patterns of fresh and used 3V17W/Al catalyst.

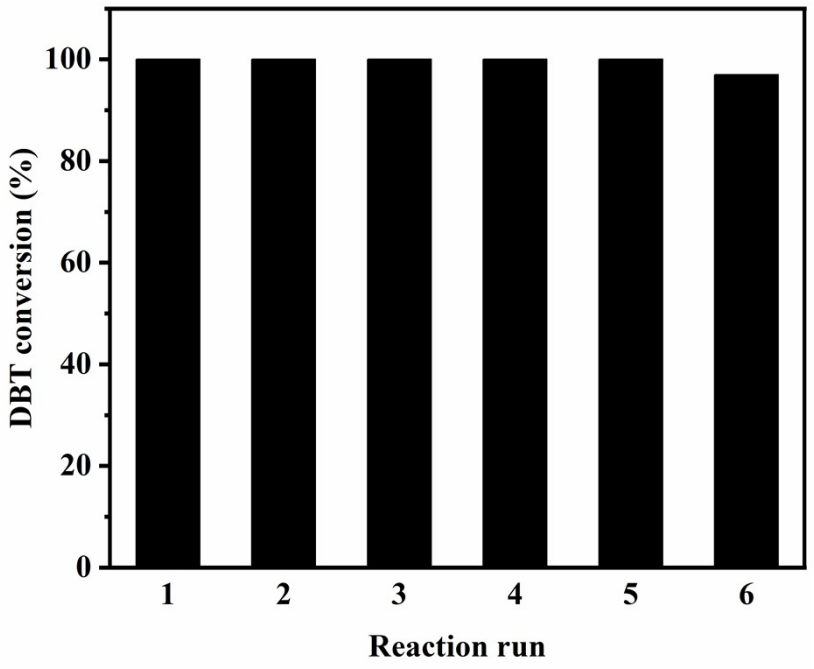

Fig. S3. Periodic ODS performance of 3V17W/Al catalyst. Reaction conditions: 3.0 g of model fuel (500 ppmw S (2875 ppmw DBT) in *n*-hexadecane), 0.03 g catalyst, reaction temperature: 353K, and TBHP/DBT molar ratio: 5.0.

Table S1. Comparison between fresh and used 3V17W/Al catalyst on an SO_3-free oxide basis.

Sample	W (wt%) SO_3-free basis	V (wt%) SO_3-free basis	SO_3 (wt%)
Fresh catalyst	18.11	3.49	-
Used catalyst	15.95	2.65	2.10

Table S2. Comparison of the catalytic performance of 3V17W/Al with other tungsten-based catalysts reported in the literature for ODS of DBT.

Catalyst	Oxidant	Sulfur consentration (ppm)	T (K)	extractor	Time (min)	Conversion (%)	Ref.
3V17W/Al	TBHP (O/S=5)	500 (DBT)	353	-	2	100	This work
WO_x/ZrO_2 (TA-700)	H_2O_2 (O/S=20)	-(DBT)	333	γ-butyrolactone	3	100	[1]
W-SiO_2-20	H_2O_2 (O/S=2.5)	500 (DBT)	333	-	30	100	[2]
CoW(15)/CNT	H_2O_2 (O/S=6)	500 (DBT)	348	acetonitrile	40	100	[3]
WO_3/g-C_3N_4	H_2O_2 (O/S=3)	500 (DBT, 4-MDBT, 4, 6-DMDBT and 3-MBT)	323	-	40	100	[4]
WO_3/TiO_2	H_2O_2 (O/S=4)	500 (DBT)	323	acetonitrile	60	100	[5]
WO_x/ZrO_2 (7 W/nm^2)	H_2O_2 (O/S=0.2)	9882 (DBT)	333	acetonitrile	5	70	[6]
N-WO_3-NH_2-SiO_2@SiC	H_2O_2 (-)	500 (DBT)	328	acetonitrile	160	100	[7]
35%WO_3/Al_2O_3	TBHP (O/S=1.5)	55 (DBT in kerosene)	383	-	180	78.76	[8]
1%wt sodium tungstate	TBHP (O/S=32)	140 (hydrotreated diesel fuel)	363	methanol (with 15 min Ultrasound)	15	91	[9]

-	TBHP (O/S=2)	500(Model diesel: 50 ppm thiophene, 150 ppm DBT, and 300 ppm 4,6-DMDBT in n-octane.)	323	N,N-dimethylformamide (DMF)	30	100	[10]
$Co/Mn/Al_2O_3$	TBHP (O/S=3)	600(Model diesel: 200 ppm thiophene, 200 ppm DBT, and 200 ppm 4,6-DMDBT in n-octane.)	333	N,N-dimethylformamide (DMF)	30	87	[11]