

Supplementary information

of

Ternary choline chloride/benzene sulfonic acid/ethylene glycol deep eutectic solvents for oxidative desulfurization at room temperature

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Table S1. Comparison of desulfurization efficiencies with reported data.

Entry	Catalyst	Initial sulfur content /ppm	T /°C	O/S	Oxidant	Sulfur removal /%	Time /min	Ref.
1	ChCl/2BSA/EG	500(DBT)	25	5	H ₂ O ₂	100	100	This work
		500(BT)	25	5	H ₂ O ₂	100	120	
		500(4,6-DMDBT)	25	5	H ₂ O ₂	100	120	
2	Acetamide/2GA	500(DBT)	60	6	H ₂ O ₂	99.0	180	[1]
3	ChCl/1.5BA/PEG	500(DBT)	60	6	H ₂ O ₂	99.2	120	[2]
		500(4,6-DMDBT)	60	4	H ₂ O ₂	57.9	120	
4	W/Uio-66(Zr)	1000(DBT)	30	4	H ₂ O ₂	100	25	[3]
5	Ti-BDC-A	500(DBT)	25	6	Cumene hydroperoxide	100	10	[4]
6	VO-MoO ₂ @NC	500(DBT)	70	4	Cumene hydroperoxide	100	40	[5]
		500(4,6-DMDBT)	70	4	Cumene hydroperoxide	100	40	
7	Fe ₃ O ₄ @W-MoO ₃ @MOF	2000(DBT)	60	∞	O ₂	100	60	[6]
		2000(BT)	60	∞	O ₂	71.2	120	
		2000(4,6-DMDBT)	60	∞	O ₂	80.2	120	
8	L-Pro/p-TsOH	500(DBT)	60	5	H ₂ O ₂	99.0	180	[7]
		500(BT)	60	5	H ₂ O ₂	99.0	180	
		500(4,6-DMDBT)	60	5	H ₂ O ₂	99.0	180	
9	[Hnmp]HCOO	500(DBT)	50	5	H ₂ O ₂	99.0	180	[8]
10	[MIMPs] ₃ PMo ₆ W ₆ O ₄₀	500(DBT)	60	2.5	H ₂ O ₂	100	40	[9]
11	FePcF ₁₆ -O-FePcF ₁₆ /4-Mpy	200(DBT)	30	40	H ₂ O ₂	99.4	20	[10]

References

- [1] L. Sun, Z. Zhu, T. Su, W. Liao, D. Hao, Y. Chen, Y. Zhao, W. Ren, H. Ge, H. Lü, Novel acidic eutectic mixture as peroxidase mimetics for oxidative desulfurization of model diesel, *Appl. Catal., B-Environ*, 255 (2019) 117747.
- [2] W. Jiang, H. Jia, H. Li, L. Zhu, R. Tao, W. Zhu, H. Li, S. Dai, Boric acid-based ternary deep eutectic solvent for extraction and oxidative desulfurization of diesel fuel, *Green Chem.*, 21 (2019) 3074-3080.
- [3] G. Ye, H. Wang, W. Chen, H. Chu, J. Wei, D. Wang, J. Wang, Y. Li, In Situ Implanting of Single Tungsten Sites into Defective UiO-66(Zr) by Solvent-Free Route for Efficient Oxidative Desulfurization at Room Temperature, *Angew Chem Int Ed Engl*, 60 (2021) 20318-20324
- [4] G. Ye, Y. Gu, W. Zhou, W. Xu, Y. Sun, Synthesis of Defect-Rich Titanium Terephthalate with the Assistance of Acetic Acid for Room-Temperature Oxidative Desulfurization of Fuel Oil, *ACS Catal.*, 10 (2020) 2384-2394.
- [5] J. Zou, Y. Lin, S. Wu, Y. Zhong, C. Yang, Molybdenum Dioxide Nanoparticles Anchored on Nitrogen-Doped Carbon Nanotubes as Oxidative Desulfurization Catalysts: Role of Electron Transfer in Activity and Reusability, *Adv. Funct. Mater.*, 31 (2021) 2100442.
- [6] S.-W. Li, W. Wang, J.-S. Zhao, Highly effective oxidative desulfurization with magnetic MOF supported W-MoO₃ catalyst under oxygen as oxidant, *Appl. Catal., B-Environ*, 277 (2020) 119224.
- [7] L. Hao, M. Wang, W. Shan, C. Deng, W. Ren, Z. Shi, H. Lu, L-proline-based deep eutectic solvents (DESS) for deep catalytic oxidative desulfurization (ODS) of diesel, *J. Hazard. Mater.*, 339 (2017) 216-222.
- [8] H. Lu, S. Wang, C. Deng, W. Ren, B. Guo, Oxidative desulfurization of model diesel via dual activation by a protic ionic liquid, *J. Hazard. Mater.*, 279 (2014) 220-225.
- [9] J. Wang, B. Yang, X. Peng, Y. Ding, S. Yu, F. Zhang, L. Zhang, H. Wu, J. Guo, Design and preparation of polyoxometalate-based catalyst [MIMPs]₃PMo₆W₆O₄₀ and its application in deep oxidative desulfurization with excellent recycle performance and low molar O/S ratio, *Chem. Eng. J.*, 429 (2022) 132446.
- [10] Z. Fang, N. Li, Z. Zhao, Z. Zhu, W. Lu, F. Chen, J. Wang, W. Chen, Bio-inspired strategy to enhance catalytic oxidative desulfurization by O-bridged diiron perfluorophthalocyanine axially coordinated with 4-mercaptopyridine, *Chem. Eng. J.*, 433 (2022) 133569.