One-pot synthesis and characterization of tungsten-containing meso-ceria with enhanced heterogenous oxidative desulfurization in fuels

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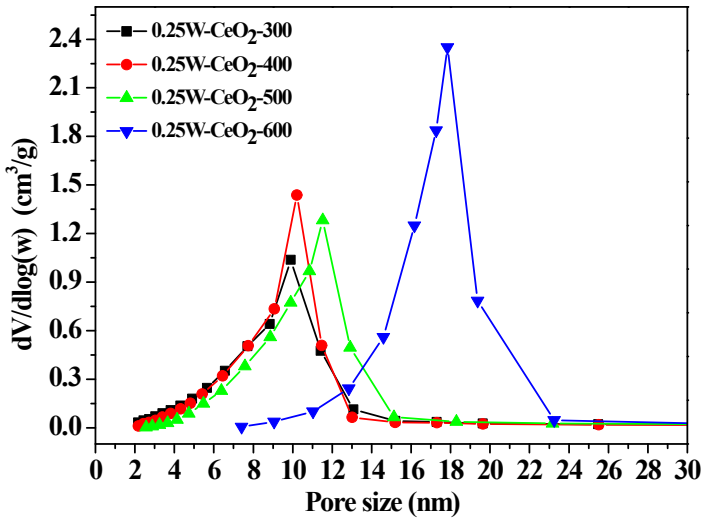

Fig. S1 Pore size distribution curves of the samples.

Influence of the amount of catalyst on the catalytic activity

The effect of the amount of catalyst on the sulfur removal is depicted in Fig. S2. It was distinctly observed that the conversion of DBT increased from 83.5% to 99.2% in 50 min by adjusting the amount of catalyst from 0.01 to 0.05 g. The results implied that lower amount of catalyst could not achieve deep desulfurization. By increasing the amount of catalyst to 0.03g, more active sites were provided, leading to the obvious improvement of activity. However, it was worthy noted that the 0.05 g of catalyst did not improve the activity, which might be due to the aggregation of excessive catalyst in the presence of H_2O_2. Hence, it is not good for the removal of DBT in the desulfurization process. Hence, the optimal amount of catalyst was chosen as 0.03g.

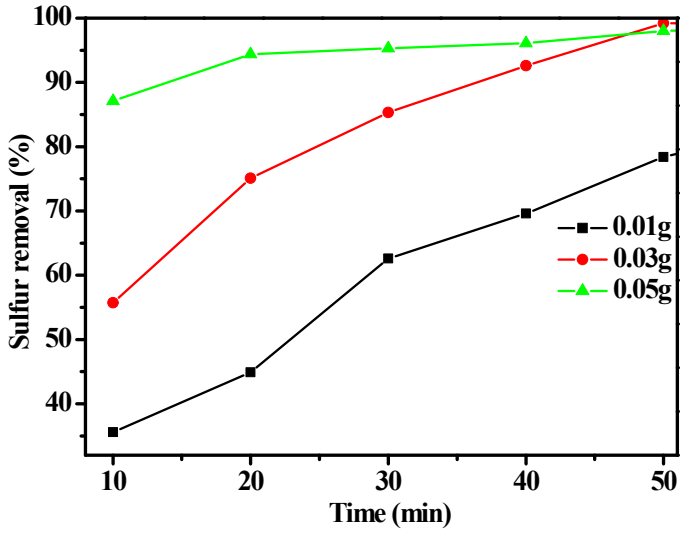

Fig. S2 Influence of the amount of catalyst on the sulfur removal.

Reaction condition: T = 30℃, t = 50 min, O/S = 5.

Influence of O/S molar ratio on the catalytic activity

Fig. S3 exhibits the influence of the O/S molar ratio of as-prepared catalyst on the sulfur removal. The removal of DBT could reach 75.4%, when the molar ratio of H_2O_2 was (O/S= 3) slightly higher, compared to the stoichiometric requirement (O/S= 2) indicating that partial oxidant decomposed during reaction. Excessive oxidant is helpful for removing sulfur-containing compounds in model oil. Further increasing the molar ratio of O/S to 5, 99.2% of DBT was removed. When the molar ratio of O/S was increased to 7, the catalytic activity of was not dramatically improved, and the value of O/S = 5 was chosen as the optimal ratio in the subsequent examination.

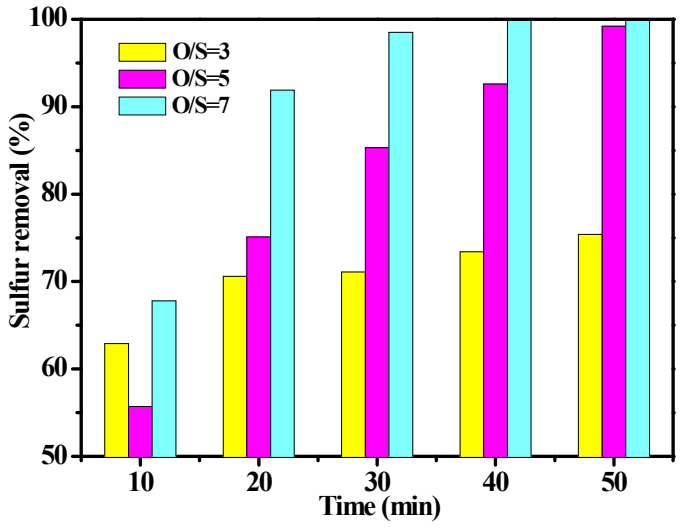

Fig. S3 Influence of O/S molar ratio on the catalytic activity of catalyst

Reaction condition: m (catalyst) = 0.03 g, T = 30℃, t = 50 min.

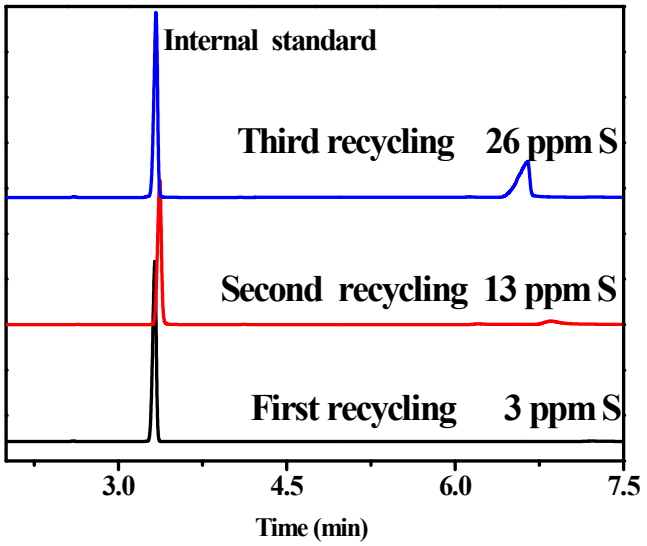

Fig. S4 Recycle of the desulfurization system. Reaction conditions: T = 30℃, m (catalyst) = 0.03 g, O/S= 5, t = 50 min.