

## **Oxidation of refractory sulfur-containing compounds with molecular oxygen catalysed by vanadoperiodate**

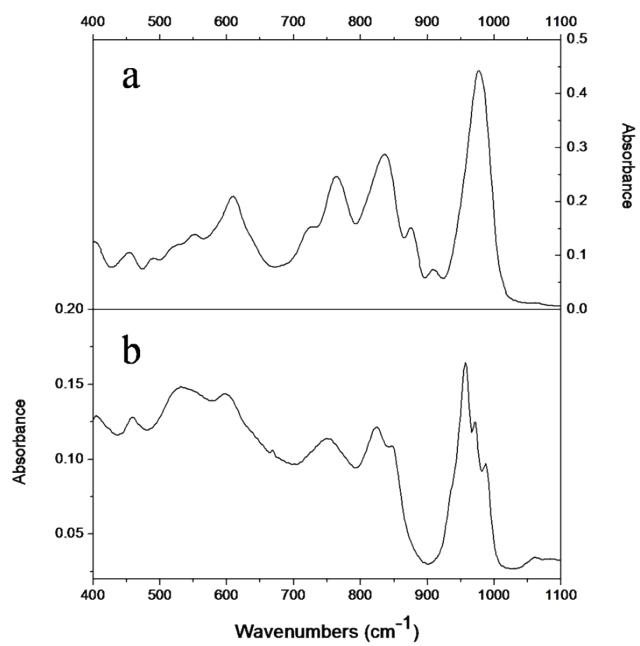
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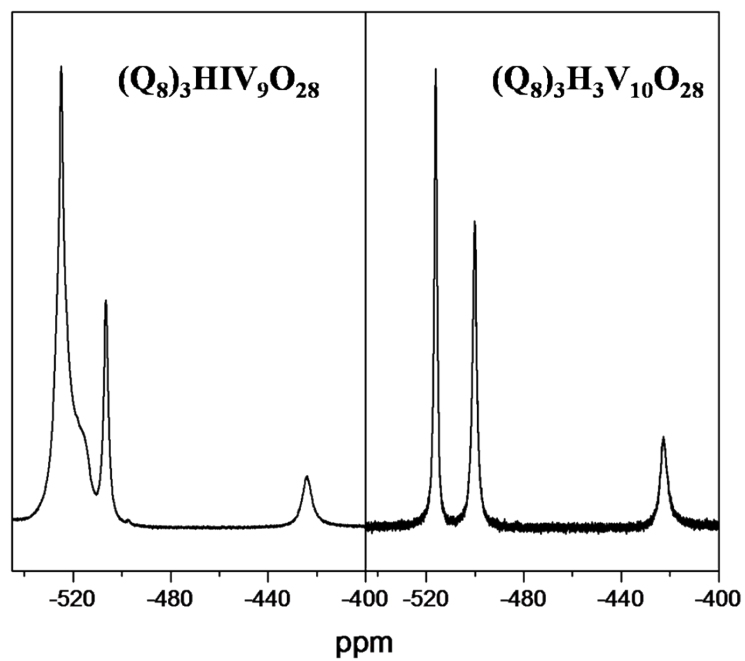
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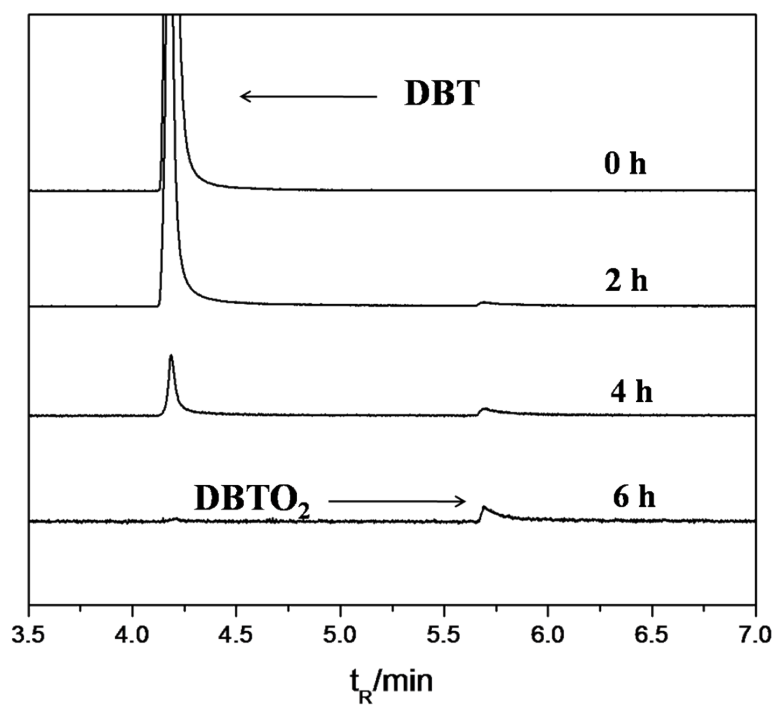
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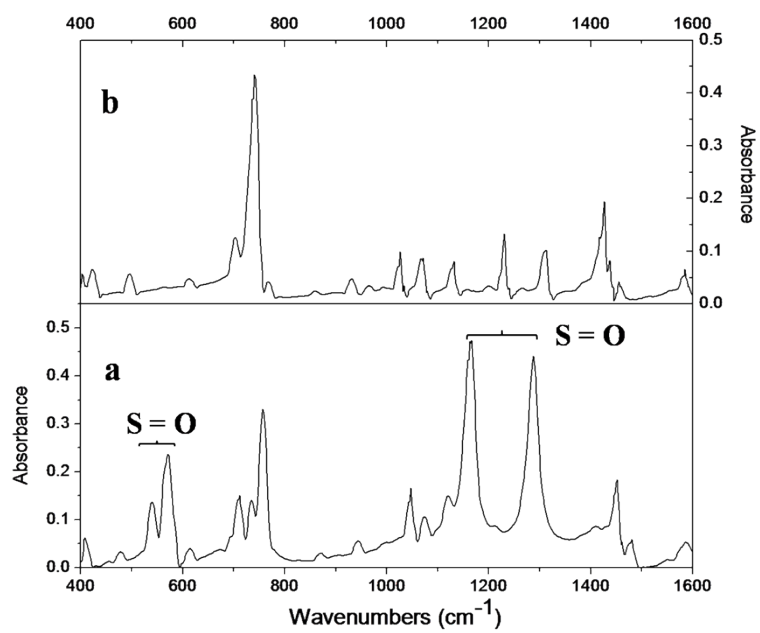
**Fig. S1.** (a), FT-IR spectrum of  $(Q_8)_3HIV_9O_{28}$ ; (b), FT-IR spectrum of  $(Q_8)_3H_3V_{10}O_{28}$ .



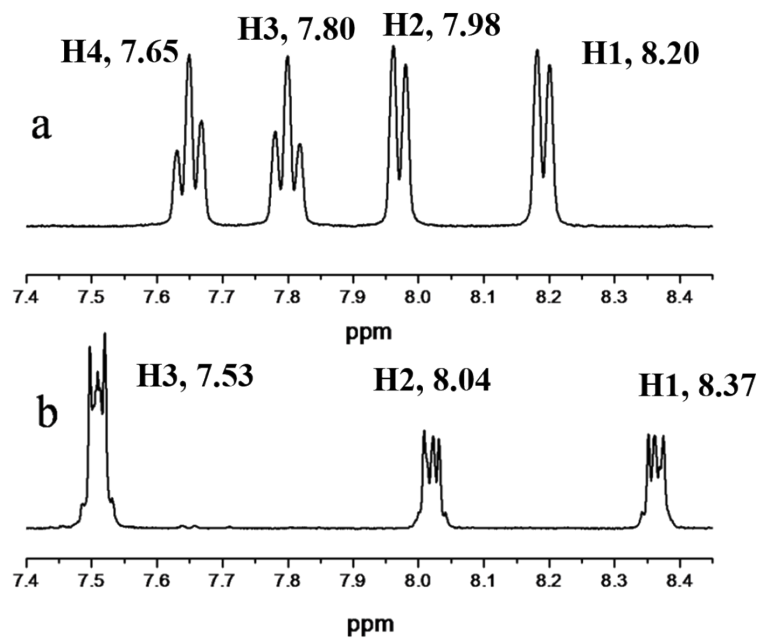
**Fig. S2.**  $^{51}\text{V}$  NMR spectra of  $(\text{Q}_8)_3\text{HIV}_9\text{O}_{28}$  and  $(\text{Q}_8)_3\text{H}_3\text{V}_{10}\text{O}_{28}$ .



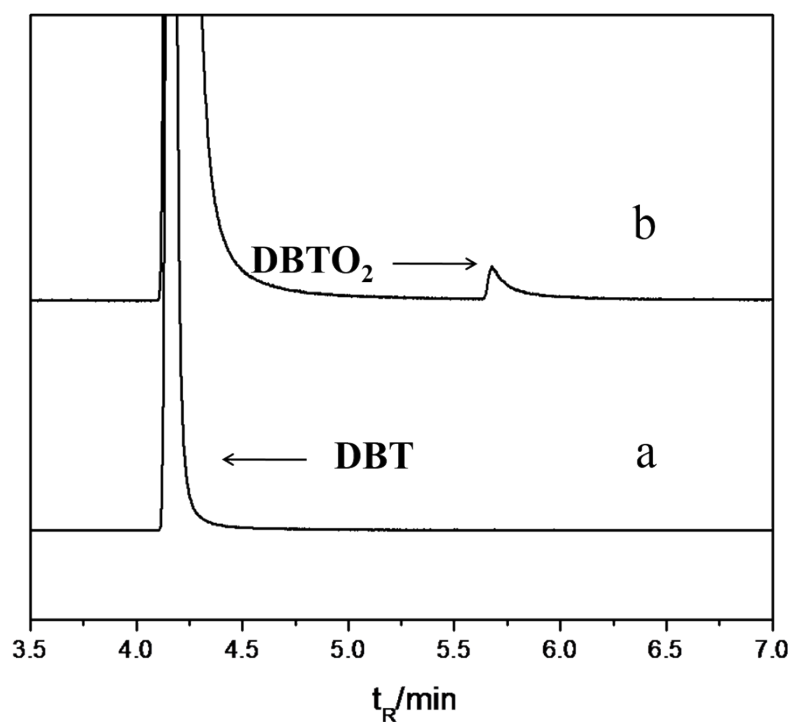
**Fig. S3.** Sulfur-specific GC-FPD chromatograms of the oxidation of DBT in decalin. Reaction conditions:  $(Q_8)_3\text{HIV}_9\text{O}_{28}$  (40 mg), DBT(0.3 mmol) in 20 ml decalin, reaction temperature 90 °C, oxidant  $\text{O}_2$  (1 atm).



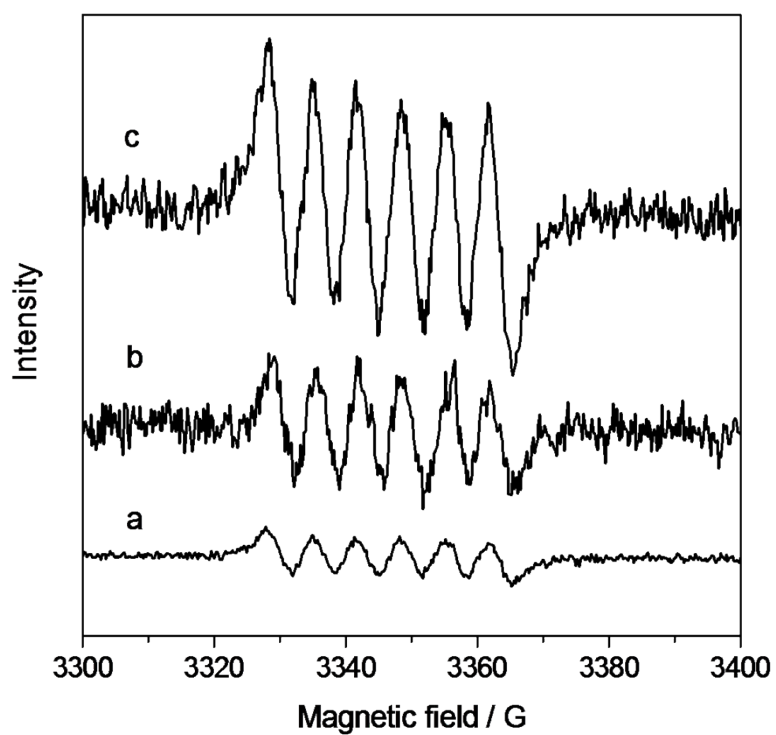
**Fig. S4.** FT-IR spectrum of DBT after reaction, wavenumbers : 400 ~ 1600 cm<sup>-1</sup>. (a), DBT after reaction; (b), DBT.



**Fig. S5.** (a),  $^1\text{H}$  NMR spectrum of  $\text{DBTO}_2$ ; (b),  $^1\text{H}$  NMR spectrum of DBT.

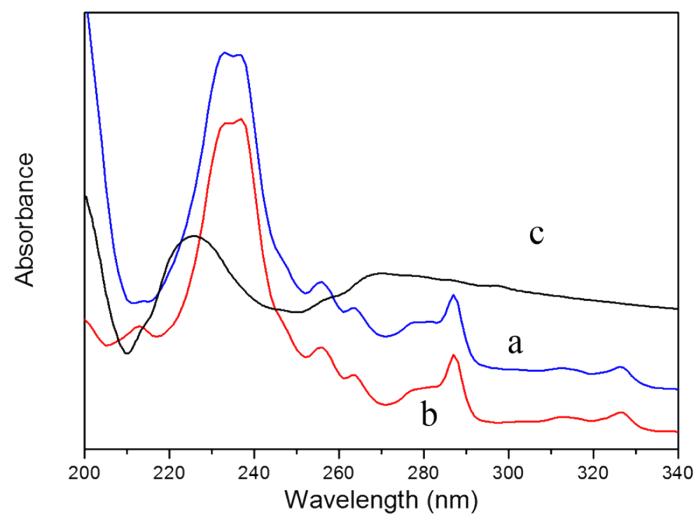


**Fig. S6.** Sulfur-specific GC-FPD chromatograms. (a) reaction product of experiment 1; (b) reaction product of experiment 2. Reaction conditions: (a) Reaction conditions:  $(Q_8)_3HIV_9O_{28}$  (40 mg), DBT (0.3 mmol) in 20 ml decalin, reaction temperature 90 °C, Argon (1 atm); (b) Reaction conditions:  $(Q_8)_3HIV_9O_{28}$  (40 mg), DBT (0.3 mmol) in 20 ml decalin, reaction temperature 90 °C, Argon (1atm), oxidant  $O_2$  (1 atm).



**Fig. S7.** *In situ* ESR spectra of DMPO-O<sub>2</sub><sup>•-</sup> adduct generated in the oxidative desulfurization process. (a) the sample tested with catalyst at 40 °C. (b) the sample tested with catalyst at 50 °C. (c) the sample tested with catalyst at 60 °C.





**Fig. S8.** UV-Vis spectra of DBT. All spectra were collected from  $0.02 \text{ mmol L}^{-1}$  DBT and  $30 \text{ mg L}^{-1}$   $(\text{Q}_8)_3\text{HIV}_9\text{O}_{28}$  solution. (a) DBT and  $(\text{Q}_8)_3\text{HIV}_9\text{O}_{28}$  dissolved in decalin at  $90 \text{ }^\circ\text{C}$  for 1 h under 1 atm Ar; (b) DBT dissolved in decalin at  $90 \text{ }^\circ\text{C}$  for 1 h under 1 atm Ar; (c)  $(\text{Q}_8)_3\text{HIV}_9\text{O}_{28}$  dissolved in decalin at  $90 \text{ }^\circ\text{C}$  for 1 h under 1 atm Ar.