CHAPTER V

CONCLUSION AND SUGGESTION

The objective of this research in searching for efficient catalysts for the oxidation of sulfur compound was achieved successfully. Several polyoxometalates catalysts were synthesized and tested activity in the oxidation of sulfur model compounds. They are $Na_2H[PMo_{12}O_{40}]$, $Na_2H[PW_{12}O_{40}]$, $H_3PMo_{12}O_{40}$, $H_3PW_{12}O_{40}$, $(VO)H[PMo_{12}O_{40}]$, $(VO)H[PW_{12}O_{40}]$, $(n\text{-}Bu_4N)_3[PW_{12}O_{40}]$, $(n\text{-}Bu_4N)_4[PVW_{11}O_{40}]$, $(n\text{-}Bu_4N)_5[PV_2W_{10}O_{40}]$ and $(n\text{-}Bu_4N)_6[PV_3W_9O_{40}]$. It was found that the catalytic activity depended on the kind of metal and countercation of the catalysts. The experimental results showed that the relative catalytic activity of the W catalysts was higher than the catalyst activity of Mo catalysts. $Na_2H[PW_{12}O_{40}]$ and $H_3PW_{12}O_{40}$ were the most active in oxidation of model sulfur compound. The catalyst containing 3 vanadium atoms gave the highest sulfone yield due to the lower reduction temperature of the reduction peaks indicated the higher reduction potential than the catalyst containing 1 and 2 vanadium atoms.

The reactivity order of the model sulfur compounds was: dibenzothiophene (DBT) > 4,6-dimethyldibenzothiophene (4,6-DMDBT) > benzothiophene (BT).

The oxidative desulfurization of a commercial diesel oil was investigated and performed at 70 °C in 5 h, it demonstrated that the trend of reactivity order of catalysts were the same as that obtained from the sulfur model compounds. The $Na_2H[PW_{12}O_{40}]$ catalyst in the combination of phase transfer catalyst (PTC) was able to remove sulfur in the oil up to 99%.

<u>Suggestion for the future work</u>

From all aforementioned results and discussion, the future work to improve the system should be focused on the modification of catalyst e.g. addition of other transition metals such as Cr.