CHAPTER VIII
CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Bimetallic Fe-Ce-MCM-48, Fe-Ti-MCM-48, and Fe-Ti-TUD-1 mesoporous materials were successfully synthesized from silatrane precursor via sol-gel process. High surface area over 1000 m^2/g was obtained for bimetallic MCM-48 and 725 m^2/g for bimetallic TUD-1. The lower amount of metal loaded was highly dispersed into mesoporous framework while the higher metal content provided the nanocluster of metal oxide which reduced the active sites and the catalytic activity. Use of cerium glycolate as cerium precursor for Fe-Ce-MCM-48 synthesis could incorporate cerium into the framework without the agglomeration of cerium oxide even at high cerium contents. Comparing with pure MCM-48, Fe-Ti-MCM-48 had the higher hydrothermal stability.

As for phenol hydroxylation activity, 0.01Fe-0.01Ti-TUD-1 showed 93.1% conversion at 363 K with 53.4% hydroquinone and 46.6% catechol selectivity while the activity was dropped under UV light at ambient temperature. At 323K the conversion of 0.01Fe-0.01-MCM-48 was 56.9% whereas the conversion was slightly improved to 58.2% under UV lamp at room temperature. Bimetallic TUD-1 performed the better activity than bimetallic MCM-48. This is an advantage of having larger reactant and product molecules to diffuse through the channel.

Recommendations

Phenol hydroxylation is only the model reaction that is used to observe the activity of the catalyst. The other update applications which are focused by many international researchers, such as the conversion of biomass, should be investigated to obtain more useful ability of the catalyst. Also different metal atoms should be incorporated to study in various applications. In addition, a bigger scale of the experiment could be considered for a more practical application.