CHAPTER V
CONCLUSION AND SUGGESTIONS

The polyoxometalate, $[(n\text{-}C_4H_9)_4N]_4H[PW_{11}M^{X+}(H_2O)O_{39}]$ M = Co, Cu and Fe were synthesized and impregnated on mesoporous material, MCM-41, to prepare supported catalysts with variable loading amounts of 5-40wt% using incipient wetness impregnation method. All catalysts were characterized by FT-IR, XRD, TGA, XRF and N_2 adsorption techniques.

The prepared catalysts were used for cyclohexane oxidation. Parameters affecting the reaction were studied. The results showed that % product (cyclohexanol and cyclohexanone) yield increased with increasing amount of oxidant and reaction time. High catalytic activity was found when the reaction was performed at 20%loading, 5.1 wt%, 80°C, for 8 h and used 30% H_2O_2 (in water) molar ratio H_2O_2/cyclohexane =3 as oxidant. The maximum % yield of product obtained using 20%CoPOM/MCM-41 was 3.32%. The selectivities of cyclohexanol and cyclohexanone were 30% and 70% respectively.

For 20%CuPOM/MCM-41, even if higher % product yield than 20%CoPOM/MCM-41, a lot of acid by-product was also produced.

In the case of different initiator used in reaction, the result indicated that the methyl ethyl ketone was highest % yield of product.

For the comparison of the preparation method of the supported catalysts was found the incipient wetness impregnation method could immobilize POM on MCM-41 more than the wetness impregnation.

For the reusability of the catalyst, after three cycles, its activity slightly dropped which might be caused by the leaching of POM from the support.

Comparison between the supported and homogeneous catalysts for cyclohexane oxidation, it could be seen that the supported catalysts showed

comparable catalytic activity to the homogeneous CoPOM. The main advantages of the supported system were the reusability and the ease of separation from the reaction. Moreover, the supported catalyst remained effective in the absence of solvent, this was a good benefit for the environment in view of the solvent contamination. The mechanism of the oxidation reaction is via radical pathway.

Suggestion for the future work

Future work for the improvement of the system should be focused on the study of other transition metals, e.g. V or Ni.