CHAPTER IV

CONCLUSION

From the proceeding results and discussion, the main focus of this research is to search for the optimum conditions for the oxidation of hydrocarbons, alcohols and sulfur-containing compounds catalyzed by chromium complexes.

$Cr(str)_3$ and $Cr(pic)_3$ were used to catalyze the oxidation of alcohols. It can be concluded that the oxidation with TBHP catalyzed by both chromium(III) complexes at 70°C for 24 h afforded the good result for the secondary alcohols to the corresponding carbonyl compounds. However, steric hindrance had a negative effect on the yields for these catalytic oxidations. The oxidation gave the best results for primary alcohols to the corresponding carboxylic acids, especially in the case of benzylic alcohols. Saturated primary alcohols gave moderate yields. The mechanism of oxidation involved a radical pathway and gave the corresponding aldehydes prior to overoxidation to carboxylic acid. The catalytic oxidation by $Cr(str)_3$ expressed better yields than $Cr(pic)_3$. However the use of insoluble $Cr(pic)_3$ as a catalyst was convenient in terms of the separation of a catalyst from the desired product. When $Cr(pic)_3$ was recycled and reused to catalyze alcohols oxidation, the catalytic ability was noted to decrease. The use of other oxidants such as H_2O_2 or NaOCl afforded the unnecessary ability for the oxidation.

The oxidation of sulfur-containing compounds with TBHP by both catalysts took place rapidly. The conversion of sulfide was excellent; however, it is difficult to control the selectivity of the reaction. This developed system seems to be appropriate for chemical remediation of sulfur containing compounds in environmental point of view.

The oxidation of hydrocarbons was acheived under the same condition for the oxidation of alcohols. Cyclohexane was used as a model compound for the optimization of the reaction conditions. It was found that the oxidation gave the poor yield. Nevertheless, the catalytic oxidation expressed the best result for oxidation at a benzylic position when using by $Cr(pic)_3$ in the presence of TBHP. Cyclic alkyl substrates such as acenaphthene and tetrahydronaphthalene were identified to give

mono-oxidation products selectively under the reaction conditions. In addition the oxidation of arylacetic esters was found that $Cr(pic)_3$ gave poor result of the corresponding carbonyl products.

Suggestion for the future work

The modification of this catalytic oxidation system for secondary alcohols to the larger scale should be attempted. The variation of metal picolinate catalysts for the functionalizaton of saturated hydrocarbon should be investigated.

Moreover, other types of alkenes, aromatic hydrocarbons and alcohols should also be examined to explore the regioselectivity and stereoselectivity of the system. Furthermore, the application for certain natural products should be explored with this catalytic system.

Other types of sulfur-containing compounds as well as thiol or sulfide substrates should be tried to extend the scope of this work.