

CHAPTER IV

CONCLUSION

During the course of this research, nine cobalt complexes were screened for their capability to use as a catalyst in the epoxidation reaction. It was observed that four cobalt complexes: cobalt(II) complexes of calix[4]pyrrole **10**, thiophen-*o*-phen **12**, salophen **13**, and saloa **14** displayed impressive preliminary catalytic results. Further study disclosed that cobalt(II) complexes of calix[4]pyrrole **10** and thiophen-*o*-phen **12** exhibited good catalytic activity. Thus, two catalytic systems for alkene epoxidation utilizing these two complexes were developed. Eventhough these two cobalt catalysts were previously synthesized and reported, the use as catalysts for epoxidation of alkene has never been addressed. Therefore, this is the first report on the utilization of these two complexes in catalytic aspects. In addition, the optimum conditions for the epoxidation of alkenes catalyzed by cobalt complexes, the solvent effect, the stereoselectivity and regioselectivity study of these developed systems were thoroughly examined.

The results from the competitive epoxidation reaction examination between cyclohexene, 1-dodecene and 1-methylcyclohexene pointed out that 1-methylcyclohexene was the most reactive substrate, followed by cyclohexene and 1-dodecene, respectively. This result strongly implied that the active site of the catalyst possessed electrophilic in character.

According to the stereoselectivity and regioselectivity investigation, the epoxidation of *cis*-stilbene catalyzed by cobalt(II) complexes of calix[4]pyrrole **10** and thiophen-*o*-phen **12** gave a mixture of *cis*- and *trans*-stilbene oxides in approximately 1:1 ratio, however, the epoxidation of *trans*-stilbene with same conditions obliged only *trans*-stilbene oxide product. This result provide a useful information for mechanistic interpretation. The highly regioselective reaction of this developed system could be observed from the experiment of 4-vinylcyclohexene.

Furthermore, it was shown that this developed epoxidation system could be employed for other alkenes. It was found that most alkenes could be transformed to the corresponding epoxides in moderate to good yield. More yield could certainly be obtained if the condition of the system was a bit modified.

Propose for the future work

This research concerned with the methodology development for the epoxidation of alkenes catalyzed by cobalt complexes. The outcome opened many possibilities to deal with future exploration. As discussed earlier, metal calix[4]pyrrole has never been utilized as a catalyst in organic transformation, therefore the variation of metal from cobalt to chromium or manganese *etc.* may provide other intriguing results in terms of product yield and selectivity. The exploitation of these developed catalytic systems for the manipulation of biologically active compounds containing various functional groups should be another interesting point. Since catalytic and stereoselective system is still required. The application of these catalytic systems for asymmetric synthesis is another challenge field of study to be concentrated. This present examination is a profitable example for the epoxidation methodology in crucial chemical reaction nowadays, and may be the one of valuable chemical literature data in the near future.

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