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Microwave induced solid-state interactions for the synthesis of Fischer-Tropsch catalysts

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CHAPTER FOUR

SCOPE OF THIS STUDY

Most of the recent reviews about Fischer-Tropsch synthesis (FTS) have focused on either developing processes for Fischer-Tropsch synthesis (FTS) or employing a better method of catalyst preparation, improving catalytic performance (activity and selectivity), activating the catalyst prior to Fischer-Tropsch reaction using conventional heating methods. Very few reviews have specifically addressed recent development in catalytic activity and selectivity using microwave pre-treatment as a form of catalyst activation.

Scurrell et al. reported that there are benefits of microwave pre-treatment for Zn-ZSM-5 catalyst prepared by solid-state ion-exchange (Scurrell et al., 2002). In addition, they mentioned that there are effective benefits in the preparation of solid catalysts using microwave radiation (Scurrell et al., 2002). Hence this project aims to examine the influence of microwave pre-treatment on iron-oxide containing catalyst precursors and reveal the behaviour of the resulting solid after microwave pre-treatment in Fischer-Tropsch Synthesis (FTS). We are investigating the microwave effect on catalytic activity and selectivity using Fischer-Tropsch as a test reaction. In iron-oxide based catalysts, there is a possibility of having magnetite or hematite or both present in the catalyst. Magnetite is a good microwave absorber while hematite is not. This project aims to examine the microwave effect on magnetite-containing catalysts too.

The experimental approach in this study intends to prepare supported and unsupported iron-oxide catalysts, characterize those iron-oxide containing catalysts precursors and finally testing their activity and product selectivity using Fischer-Tropsch synthesis using

a fixed bed reactor. The effect of duration, bed size and shape and the power level will be investigated when using the microwave pre-treatment.

Few Fischer-Tropsch tests will be carried out on supported cobalt catalysts to examine the microwave effect.