

## CHAPTER V

### CONCLUSION

Effect of pH (8.0 to 11.0) and Si/Fe ratios on synthesis of iron-containing MFI catalysts were investigated. Fe-MFI was synthesized by crystallizing the solution mixture of iron nitrate, sodium silicate, tetrapropyl ammonium bromide, and sulfuric acid at the temperature of 170°C for 4 days. The crystallinity of Fe-MFI, the particle size, morphology, the iron content, and the amounts of iron at framework and non-framework sites are affected by the pH of gel. ESR spectra indicate that the optimal pH ranging from 9.0 to 9.5 can give the highest relative intensity of the framework iron site. Therefore, the pH value of 9.0 was chosen to synthesize the Fe-MFI with various Si/Fe ratios (90 to 10). Although Fe-MFI with the Si/Fe ratio in gel of 90 and 30 were successfully synthesized at the pH value of 9.0 at the Si/Fe ratio in gel of 10 only amorphous material was formed. Thus, to synthesize Fe-MFI with the Si/Fe ratios from 90 to 10, the pH of gel was adjusted to more basic condition, at the pH value of 10.5 which is necessary to promote MFI formation. XRD data show that all products have MFI pure structure. The crystallinity decreases with decreasing the Si/Fe ratio. ESR spectra showed that the ratio of framework to non-framework iron site decreased with increasing the iron content.

Brønsted acid sites play an important role to produce light olefins in MTO reaction. H-Fe-MFI shows higher catalytic activity than NaH-Fe-MFI. The optimal temperature for propylene formation with less methane were observed using H-Fe-MFI (the Si/Fe ratios = 87) at the temperature of 450°C, GHSV 2000 h<sup>-1</sup> and with TOS of 40 min. When iron content increases, the catalytic activity and light olefins yield decrease, while the amount of coke

deposited increases. Spherical shape Fe-MFI gave higher yield of gas products than the twinned plus-like shape.

#### **The suggestion for future work**

Type of iron-containing catalysts, for examples, other zeolites, SAPO', AIPOs', mesoporous materials for MTO, and comparing catalytic activity with Fe-MFI under the same condition should be investigated to seek for a novel catalysts with high efficiency.



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