CHAPTER V

CONCLUSION

Al-SBA-15 was successfully synthesized by the post synthesis method, alumination and calcined at 550°C for 5 h. All synthesized mesoporous products were characterized using XRD, ICP-AES, ^{27}Al-MAS-NMR, N_2 adsorption-desorption, and SEM techniques. The XRD patterns of the Al-SBA-15 catalysts indicate that the hexagonal structure of SBA-15 is sustained. The intensity of the (100) peak increases when the Si/Al ratio in gel is increased. The result indicates that the lower the aluminum content, the higher order of the structure is obtained because the low aluminum content can be highly dispersed in the structure. It is acceptable that the Si/Al molar ratios in the products from post synthesis method are about one half of the Si/Al molar ratios in reactant mixture except the same value is obtained at the Si/Al molar ratio of 10, while the Si/Al molar ratios in the samples prepared by direct method are quite incredibly higher than the ratio in gel. Although the ^{27}Al-MAS-NMR spectrum of non-ion-exchanged Al-SBA-15 (Na/H-Al-SBA-15) presents only tetrahedral aluminum; however, it is necessary to exchange remained sodium ions in Al-SBA-15 to form H-Al-SBA-15 to enhance the acid properties of Al-SBA-15. Among the various treatment conditions, reflux with 0.01M NH_4Cl or HNO_3 for 24 h using dried Al-SBA-15 material is the most appropriate method. The tetrahedral site aluminum gradually increases with the decrease of Si/Al molar ratio, indicating that the extent of incorporation of Al atoms into the mesoporous wall of SBA-15 increases as well. The NH_3-TPD data reveal that the acidities of H-Al-SBA-15 samples increase upon the addition of aluminum in the reactant mixture.

The cracking of polypropylene has been carried out at 380°C in a batch reactor with the reaction time of 30 min. It is found that both thermal cracking and catalytic cracking of PP over Si-SBA-15 give the low conversion less than 30%. Thermal cracking of PP using the apparatus set up in this work provides higher conversion as compared to others From the overall data, conversion, liquid formation rate and product distribution, standard gasoline based on n-paraffin distribution. As a result, it can be concluded that H-Al-SBA-15 with the Si/Al molar ratios of 10 and 30 are promising to be a very active catalyst in catalytic cracking of not only PP beads but also polypropylene waste. The optimum condition for PP cracking is the reaction temperature of 380°C, reaction time of 30 min, and catalyst amount of 10% by weight to plastic. Moreover, regenerated H-Al-SBA-15 still exhibits the characteristic properties and catalytic activity very close to the fresh H-Al-SBA-15 catalyst.

The suggestion for future work

1. Modify SBA-15 by incorporation of other metal such as boron, gallium to improve the acidity of catalyst.
2. Test the catalytic activity of this catalyst in cracking of other plastic wastes such as polyethylene, polystyrene, polyvinylchloride, etc.
3. Provide Al-SBA-15 in catalytic cracking of vegetable oil (such as palm oil, coconut oil) to produce biodiesel or gasoline, due to vegetable oil is a renewable source.
4. Provide Al-SBA-15 in other application such as tranesterification of vegetable oil to produce biodiesel.