CHAPTER V

CONCLUSION

To study the catalytic activity for metathesis reaction, a new supported tungsten catalyst WO_3/SBA-15 was prepared and used as catalysts. High surface area and high thermal stability of support play roles on its activity. A mesoporous material, SBA-15, was selected as a support loading for tungsten oxide and was tested to seek the optimal temperature and the loading amount of tungsten.

SBA-15 was successfully synthesized in acidic condition by using triblock copolymer as pore-directing agent. The obtained product was used as support for preparing WO_3/SBA-15 catalyst. The incipient-wetness impregnation method was utilized in preparing the catalyst by adding dropwise the sodium tungstate solution on the calcined SBA-15 and shaking for 20 min followed by calcination at 500°C for 10 h to convert the tungstate ions to the activated tungsten (VI) oxide form.

From characterization of SBA-15, synthesized in this work, it presents the typical structure of hexagonal with high surface area of 779 m^2/g and rope-like morphology which aggregated into the wheat-like macrostructure. When SBA-15 was loaded with tungsten, the support was disturbed in part of long-range order and surface area. The phase of tungsten oxide on catalysts at tungsten loading lower than 7% has high dispersion of monomeric tungsten species as confirmed by DR-UV spectra and Raman scattering spectra.

Metathesis of 1-hexene was studied using WO_3/SBA-15 for the optimal temperature and the loading amount of WO_3.The temperature of 300°C is the suitable condition for metathesis of 1-hexene to provide the high selectivity to ethylene and propylene. At high temperature, cracking reaction of hydrocarbon is favored to form alkanes. Different loading

of WO_3 on SBA-15 makes difference in the selectivity to product. The increase of the WO_3 amount results in less formation of methane from ethane and other hydrocarbons. Each percentage of WO_3 on SBA-15 tend to different in the selectivity to product. At 1% WO_3 loading, it seem to be no effect on the selectivity to product which could be confirmed by product distribution that is similar to bared support. As the percentage of WO_3 increases from 3 to 10%, the different in selectivity to light olefins are obtained. It is shown that the elctivity to ethylene increase with increasing amount of WO_3 loading on the support. The selectivity to propylene increase with increasing WO_3 loading and reaches the maximum when the loading becomes to 5% WO_3. This might be due to pore clogging from the high amount of tungsten oxide, reducing in pore volume of the SBA-15 support. High loading of WO_3 on SBA-15 can be a driving force to form ethylene and butene via metathesis reaction of propylene. The major liquid product is the group of C_5 and C_6 hydrocarbons. The reaction temperatures, 100-500°C, do not affect product selectivity while tungsten loading drastically affected to the selectivity to both C_5 and C_6 alkanes and alkenes.

The suggestion for future work

1) Acidity of SBA-15 can be increased by adding aluminum into framework in order to promote the metathesis of butene and ethylene to propylene.
2) Varying aging temperature of gel mixture can provide different pore size of SBA-15 for preparing WO_3/SBA-15 and the activity shall be studied for metathesis reaction.