CHAPTER VII
CONCLUSIONS AND RECOMMENDATIONS

7.1 Conclusions

MCM-48 and M-MCM-48 (M=Ti, Ce and Cr) were successfully synthesized by a novel silica source known as silatrane and CTAB as a template under basic condition, with high surface area (up to 1,711 m^2/g) and narrow pore-size distribution (2.02-2.86 nm). In this research, the amount of CTAB needed was lower than conventional requirement. The synthesized MCM-48 and M-MCM-48 indicated a well-ordered structure of MCM-48 with a truncated octahedral shape. The morphology of M-MCM-48 (Ti and Ce) maintained a parent shape (truncated octahedral) while Cr-MCM-48 was an edge-truncated octahedral shape. The maximum ratios of M/Si incorporated into the MCM-48 without destroying the long-range ordered of parent structure were as follows; 0.05Ti/Si, 0.09Ce/Si, and 0.01Cr/Si. DR-UV results provided the upper limit of the metals incorporated into MCM-48 framework. The M/Si ratios incorporated into the MCM-48 without extraframework were 0.03Ti/Si, 0.03Ce/Si, and 0.01Cr/Si. The incorporation of metals to the MCM-48 improved a catalytic performance of MCM-48. The oxidation of styrene catalyzed by Ti- and Cr-MCM-48 provided %conversion higher than Ce-MCM-48. From their optimal conditions, the %conversion of styrene reached the maximum of 61.9, 96.6, and 5.1% for Ti-MCM-48-0.01, Cr-MCM-48-0.005, and Ce-MCM-48-0.03, respectively. The kinetic study of Cr-MCM-48 catalysts toward the oxidation of styrene showed the temperature, the amounts of oxidant and styrene greatly affected to the reaction rate. The rate equation from the two-stage mechanism, under a steady state assumption, was proposed to be the representative of this reaction.

7.2 Recommendations

1. Other techniques to synthesize MCM-48 as well as metal incorporated MCM-48 should be considered, such as microwave technique.

2. Other organic reactions should be tested with these materials.

3. Other applications should be studied, for example nanocasting, separation and adsorption etc.

4. To improve the selectivity of the desired product (styrene oxide), the addition step of the oxidizing agent should be investigated.

5. The rate of the secondary oxidation of styrene oxide should be studied and compared to the rate of producing styrene oxide, in order to maximize the styrene oxide product.