CHAPTER I
INTRODUCTION

Since the discovery of ordered mesoporous molecular sieve with uniform pore size (Kresge *et al.*, 1992), many researchers have paid attention to study its properties and applications. Especially, its high surface area, applications like catalyst support, adsorbent, host for nanometer-scale quantum object, and host structure for nanometer-size guest compounds, are extensively studied (Barton *et al.*, 1999).

SBA-1 is one of the ordered mesoporous materials possessing three dimensional cubic structures with space group of *Pm3n* (Che *et al.*, 2002). One of the most important properties of SBA-1 is its special pore structure, 3D channel network or cage type pore structure with open window, thus introducing heteroatom, such as titanium, chromium, vanadium and molybdenum onto or within the silica wall is possible. Therefore, development of the SBA-1 mesoporous molecular sieve material in the field of catalysis is of interest.

SBA-1 can be synthesized via a direct method using tetraethylorthosilicate [$Si(OC_2H_5)_4$, TEOS] as a silica source and a cetyltriethylammonium bromide (C_{16}TEABr) template with a large head group in highly acidic or alkaline condition (Huo *et al.*, 1994). SBA-1 can also be synthesized via sol-gel process using silatrane precursor directly prepared from fumed silica (Tunglumlert *et al.*, 2007).

Among various metal atoms that can be introduced into SBA-1, molybdenum, normally used as catalyst in many organic reactions, is chosen in this study. Because of its high catalysis activity and stability (Che *et al.*, 2001), many forms of Mo, such as coordination compound with bridge ligand, MoO_3 and Mo-glycolate, can be used.

In this study, SBA-1 is synthesized via the sol-gel process using silatrane precursor as silica source and hexadecyltrimethylammonium bromide (C_{16}TMAB) as template (Tunglumlert *et al.*, 2007). Mo-SBA-1 is also synthesized via the sol-gel process using silatrane, molybdenum glycolate precursors and C_{16}TMAB template. The synthesized catalysts were characterized using various techniques, such as X-ray diffraction (XRD), diffuse reflectance UV-VIS spectroscopy (DRUV), surface area and average pore size analyzer (Autosorb 1) and scanning electron microscope (SEM). Finally, activity study of the synthesized Mo-SBA-1 catalyst was investigated via epoxidation reaction of styrene monomer. H_2O_2, used as oxidant, reaction time, reaction temperature, amount of catalyst used and amount of Mo loaded are the factor studied. Products of the epoxidation reaction were analyzed using gas chromatography (GC). The conversion of styrene was calculated on the basis of the amount of styrene monomer used.