CHAPTER I

INTRODUCTION

1.1 Scientific rationale

The industrial development is expanding tremendously and rapidly to acquire the convenience of the mankind. These industries undoubtedly produce various kinds of pollution problems, the main cause of which stems from the residue solvent in the drainage from the productions. Almost all industrial solvents can be accumulated in the human body and afterwards solvents on water surfaces and in water pollute drastically the environment especially they reduce a great amount of dissolved oxygen, which is vital for all living organisms beneath, and consequently damage permanently the natural ecology and undoubtedly the environment as a whole.

Porous polymers in a beaded form have been developing in many research groups due to their great number of applications, such as micron-sized polymer particles in the biomedical field, starting materials for ion exchangers, polymeric supports in chromatography, solvent or oil absorbent, *etc*. Oil absorbent can adsorb oil, especially for solvent or oil from the petroleum industry.

Nowadays, the functional polymers are greatly important for unravel environment pollution, particularly solvent or oil spill. Among them, some copolymer (such as styrene-divinylbenzene) has been reported on the removal of the aromatic compounds in water. [1-5] The oil absorbent polymers have a three dimensional hydrophobic network that do not dissolve, but swell in oil. The crosslinked copolymer beads can be prepared by suspension polymerization.

One desirable way to solve part of the above pollution problems is to remove the spilled or polluted material. The absorbent materials must be produced to remove some or all of these solvents and oil. The present research synthesizes and characterizes the

alkyl(meth) acrylate-divinylbenzene copolymer beads by suspension polymerization for absorption of organic solvents and lube oil.

1.2 Objectives of the research work

1.2.1 To synthesize alkyl (meth)acrylate-divinylbenzene copolymer beads by suspension polymerization.

1.2.2 To study effects of influential parameters (such as reaction temperature, crosslinking agent concentration, diluent, etc) on swelling (absorption) of the copolymer beads

1.2.3 To characterize the properties of the synthesized beads.

1.3 Scopes of the research work

This research aims to synthesize the crosslinked copolymer beads by suspension polymerization technique for absorption of organic solvent (toluene) and lube oil. The appropriate parameters and conditions are not thoroughly known theoretically in the field. The necessary procedures to achieve the goal may be as follows:

1.3.1 Literature survey and in-depth study for this research work.

1.3.2 Synthesizing the methyl methacrylate copolymer beads crosslinked with divinylbenzene by suspension polymerization by changing the following parameters:

a) The effect of monomer phase weight fraction: 0.10, 0.12, 0.14 and 0.16.
b) The effect of agitation rates at 120, 130, 140 and 150 rpm.
c) The effect of reaction temperatures at 60, 70 and 80 °C.
d) The effect of reaction times at 3.5, 5, 6.5 and 8 hours.
e) The effect of initiator concentration of benzoyl peroxide of 0.125, 0.25, 0.5 and 1.0% weight based on the monomer phase.
f) The effect of suspending agent concentration of poly(vinyl alcohol) of 0.1, 0.15, 0.2 and 0.25% weight based on the monomer phase.
g) The effect of crosslinking agent concentration of divinylbenzene of 0.25, 0.5, 1.0 and 1.5% weight based on the monomer phase.

h) The effect of diluent composition (toluene/heptane): 100/0, 80/20, 60/40, 40/60 and 20/80% weight based on the monomer phase.

1.3.3 Synthesizing the butyl methacrylate copolymer beads crosslinked with divinylbenzene by suspension polymerization by changing the following parameters:

a) The effect of crosslinking agent concentration of divinylbenzene of 0, 0.5, 1.0 and 2.0% weight based on the monomer phase.

b) The effect of diluent composition (toluene/amyl alcohol): 80/20, 60/40, 40/60 and 20/80% weight based on monomer phase.

1.3.4 Synthesizing the lauryl methacrylate copolymer beads crosslinked with divinylbenzene by suspension polymerization by changing the following parameters:

a) The effect of crosslinking agent concentration of divinylbenzene 0.1, 0.3, 0.5, 1.0 and 1.5% weight based on the monomer phase.

1.3.5 Synthesizing the dodecyl acrylate copolymer beads crosslinked with divinylbenzene by suspension polymerization by changing the following parameters:

a) The effect of crosslinking agent concentration of divinylbenzene of 0.5, 1.0, 1.5 and 2.0% weight based on the monomer phase.

1.3.6 Synthesizing the stearyl acrylate copolymer beads crosslinked with divinylbenzene by suspension polymerization by changing the following parameters:

a) The effect of crosslinking agent concentration of divinylbenzene of 0, 0.5, 1.0 and 2.0% weight based on the monomer phase.

1.3.7 Synthesizing the methyl methacrylate copolymer beads crosslinked with divinylbenzene by suspension polymerization by changing the following parameters:

a) The effect of comonomer type is butyl methacrylate, lauryl methacrylate, dodecyl acrylate and stearyl acrylate.

1.3.8 Studying the swelling properties of the copolymer beads in toluene.

1.3.9 Studying the swelling properties of the copolymer beads in lube oil.

1.3.10 Studying the kinetics of absorption of the synthetic copolymer beads in toluene.

1.3.11 Summarizing the results and preparing the report.

1.4 Contents of the research work

This thesis consists of 5 chapters. The first chapter deals with the background, the interest and the scope of this research work. The second chapter provides the theory of suspension polymerization technique and related theory that are important for understanding. Additionally, it includes the literature reviews of previous works that give beneficial information and trends for the work. The experimental in chapter 3 described about chemical equipment, apparatus, procedure, and reaction parameters investigated in this work. The result and discussion are explained in chapter 4. The effects of various reaction parameters on particle sizes, size distribution and swelling properties were shown and discussed in details. Finally, the summary and suggestion are in chapter 5.