CHAPTER I

INTRODUCTION

Polymer is one of the most widely used materials. An application of the polymer as a high strength engineering material often suffers from its low stiffness as well as strength, when compared to metal. In order to improve these properties, the polymer is mixed with a material that is stiffer or stronger forming a "composite".

The polymer composite is a combination of a polymeric matrix and reinforced materials usually an inorganic material. Minerals have been used widely as a reinforced material for polymer. The composite often suffers from a poor bonding between the polymer matrix and the reinforced material. An interfacial can be improved by treating the mineral with a coupling agent. Most of the man-made composite materials are limited to mixing in a micrometer scale. Any void or delamination at the composite's interfaces can act as a stress a concentrator that lead to a failure of the material.

Clay mineral has emerged as a new type of the reinforced material where the mixing is taken place in the nanometer scale. It has a plate like morphology having a nanometer size thickness and a micrometer size lateral dimension. The individual clay platelet can be separated by a proper surface treatment. This is resulting in a high surface area per volume, high aspect ratio, which makes the clay an ideal reinforced material. Several properties such as heat resistance, mechanical strength, impact resistance, and permeability of gases can be improved by incorporating the clay.

The aim of work is to prepare the PMMA/clay nanocomposite via in situ polaymerization. Poly (methyl methacrylate), PMMA, is a plastic sheet manufactured in a wide variety of types such as a clear, colored, translucent, and semi-opaque sheet. These translate into a number of products; such as a plastic glass, automotive parts, toys, etc. In the commercials, PMMA sheet is produced by bulk polymerization in a *casting* process. A typical production method of PMMA sheets is a batch cell process, continuous process, and extrusion process. In this work, the batch cell processes was

used for the preparation of PMMA/clay nanocomposite via in situ polymerization. The orgnaoclays based on the tallowtrimethyl ammonium chloride (TTM), oleylmethylbis(2-hydroxyethyl) ammonium chloride (OMH) and octadecylmethyl [ethoxylate(15)] ammonium chloride (ODMH), were prepared. This was done in order to compare an effect of surfactant chemistry and surfactant concentration loading on the formation of PMMA-clay nanocomposites. The dispersion of the organoclay was revealed by XRD and TEM. Finally, the composites was be test for its hardness and impact testing.