

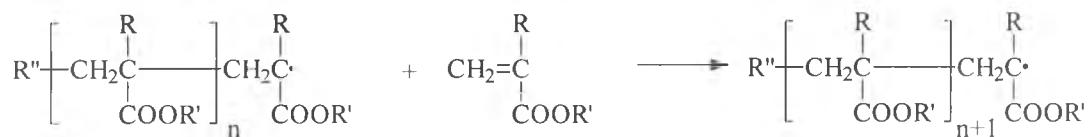


## CHAPTER I INTRODUCTION

Poly (methyl methacrylate) (PMMA) plastic sheet is manufactured in a wide variety of types, including clear and colored transparent, clear and colored translucent, and colored semi-opaque. Various surface textures are also produced. Additionally, grades with improved weatherability (added UV absorbers), crazing resistance, impact resistance, and flame resistance are available.

PMMA can be prepared by many types of polymerization methods such as bulk, solution, suspension, and emulsion polymerization, via radical polymerization mechanism as shown in figure 1.1.

Among the proposed methods, the batch polymerization that consists of preparing an oligomeric polymer syrup by batch bulk polymerization, placing syrup in between two sheets of glass and allowing polymerization, then, peeling off the glass sheets to obtain a sheet of PMMA.



**Figure 1.1** Methyl Methacrylate polymerization mechanism.

Methyl methacrylate (MMA) polymerization is accompanied by the liberation of a considerable amount of heat and a substantial decrease in volume. Both of these factors strongly influence most manufacturing processes. Excess heat must be dissipated to avoid uncontrolled exothermic polymerizations. Volume changes are particularly important in sheet-casting processes where the mold must compensate for the decreased volume.

In order to get a crystal clear PMMA sheet, bulk polymerization is used in the batch process because the polymerization occurs in the glass mold.

The PAN ASIA Industrial Co., Ltd., one of the manufacturers of PMMA sheets in Thailand, needs to adapt their process of making PMMA casted sheets. Conventionally, the batch polymerization is used with a hot-water bath as a heat source for polymerization. Change of water temperature is awkward. They have had many difficulties for adjusting their process in order to get optimum productivity.

In order to overcome this problem, they want to change the process by replacing the water bath with a new self-designed heating oven, in which the temperature can be adjusted.

We need to know the fundamental properties of the PMMA sheet in order to change the process effectively and yield optimum product properties.

In this work, the PMMA polymerization was done by using azo-type compounds as an initiator via radical polymerization. The extension of reaction, in various conditions, will be observed by determination of PMMA conversion. Mechanical properties, such as impact resistance and hardness, of the final product will be measured. Molecular weight,  $\overline{M}_n$  and  $\overline{M}_w$ , and molecular weight distribution (MWD) will be determined using gel permeation chromatography (GPC).