

CHAPTER I

INTRODUCTION

An early German patent of 1909 described emulsion polymerization (German patent 250,690,1909, Farbenfabrik Bayer A.G.). However, the misnomer probably is a result of the experiments conducted by Dinsmore R. P. in 1929 (U.S. Patent 1,732,795) which historically was one of the first reported english language works on emulsion polymerization. Dinsmore used the primitive emulsifiers, oleic acid salts and casein, for the "emulsion polymer" of butadienes. It is interesting to note that he patiently conducted the reaction for a period of 6 months at reaction temperature of 50 to 70 °C. The misnomer "emulsion polymerization" still continues today and is used to describe a process that begins with an emulsion of monomer and ends as a dispersion of polymer (Rose and Rose, 1961).

Microemulsions have several distinct advantages as a polymerization media. The physical state of the system makes control of the thermal and viscosity problems of the process easy. The initiators used in conventional emulsion polymerization are normally water-soluble initiators which may decompose either thermally, e.g. ammonium persulphate, hydrogen peroxide, or by redox reactions, e.g. persulphate with ferrous ion. In recent years, light-induced polymerization or photopolymerization has attracted much attention because of its increasing technical importance in various applications. Much effort has been devoted to free-radical photopolymerization.

In the case of photosensitized systems, it has been suggested and confirmed by laser flash photolysis that the sensitized photolysis of N-alkoxy-pyridinium ions leads to the formation of photosensitizer radical cations capable of initiating cationic polymerization of related monomers. This is illustrated for the case of anthracene-sensitized photodecomposition of the N-ethyl-2-methyl pyridinium ions (EMP^+) by reactions (1) and (2).

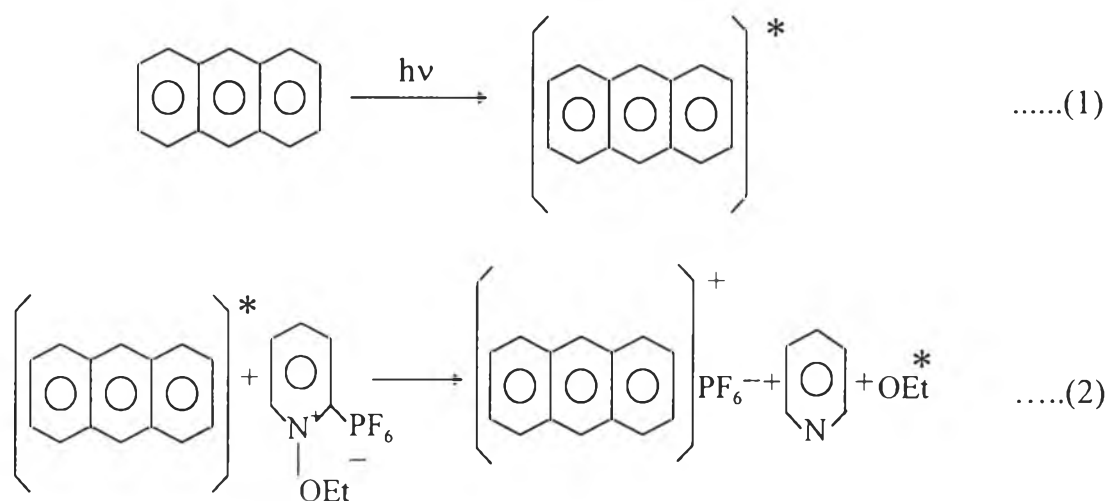
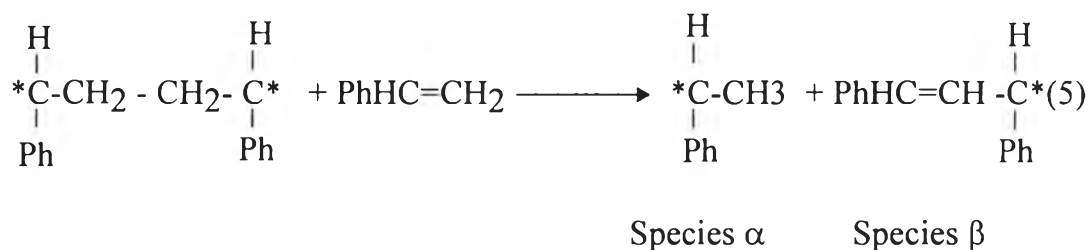
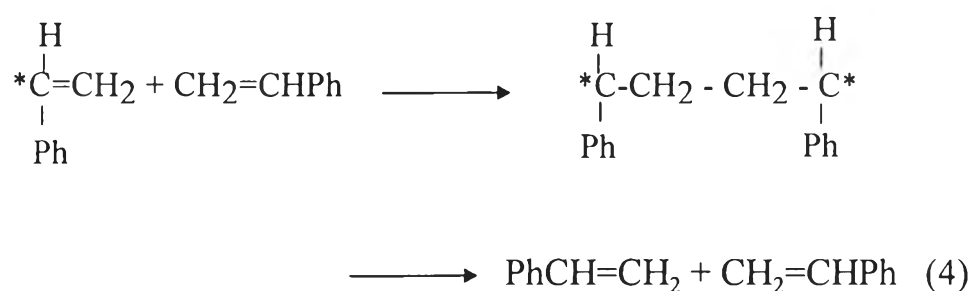
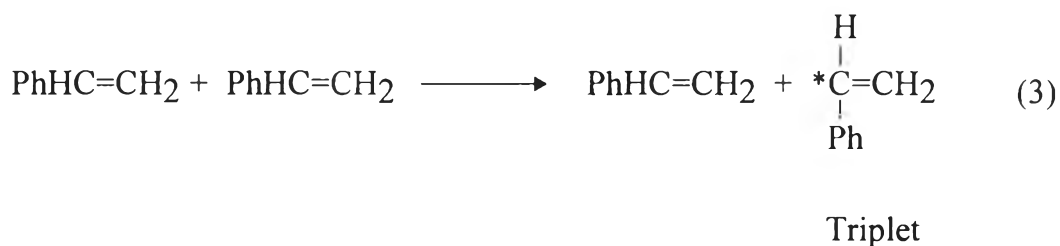


Figure 1.1 Photodecomposition of the N-ethoxy-2-methylpyridinium ions (EMP^+).

A large number of photoinitiators have been developed during the last decade. The photochemical behavior of these compounds has been studied extensively, and several comprehensive reviews have been published. The various photoinitiators used today mainly in coating applications can be classified into three major categories, depending on the type of mechanism involved in their photolysis. They are the radical formation by photocleavage, radical generation by hydrogen abstraction, and by cationic photoinitiators.



However, the photosensitizers in the photopolymerization and the water-soluble initiators in microemulsion can be impurities in the system. Some monomers undergo free-radical polymerization simply when are promoted to their excited states by UV irradiation. Styrene is a monomer which is particularly well known for this type of behavior. The mechanism of initiation is still not completely understood. It appears possible that initiation involves first the formation of triplet-state diradical by the collision of two monomer molecules. However, strong evidence exists that a monoradical is the chain-propagation species. Hence, the above tentative mechanism has been proposed, (3) to (5). Species α and β may be the real initiators for polymerization. It is

interesting that the mechanism of this, one of the oldest known polymerizations (Simon, 1839), is still somewhat obscured.

Research objective

The focus of this work is study the effect of styrene monomer concentration, NaDEHP concentration, and radiant power of UV lamp on the molecular weight average (MW), molecular number average (MN), and polydispersity index (PDI) of the polystyrene product.