CHAPTER 1

INTRODUCTION

The discovery of abundant supplies of natural gas in the Gulf of Thailand during the 1970's served as a catalyst for development of the most ambitious large scale project, known as NPC which has 2 phases. The First Petrochemical Complex (NPC I) consists of one upstream unit for producing intermediate monomers, ethylene and propylene, and four downstream units producing final products of LDPE, HDPE, VCM/PVC and PP. For polyethylene, the present production capacity is about 262,500 tons/year. The Second Complex (NPC II) will produce PE, PP, PVC, PS, ABS, SBR and Polyester by using mainly condensate and refinery naphtha as feedstock. If this complexes are complete, the annual production capacity will be 345,000 tons of polyethylene in 1992.

Polyethylene is the major member of a group of chemical compounds known as polyolefins. It is an important commercial polymer, is widely used for various industrial application and classified by densities: low, medium, and high density polyethylene. It may be produced in powders or pellets. PE pellets can be processed to final products as films, rods, tubes, sheets or molded products through processing technics such as extrusion, injection molding, casting and blow molding.

Polyethylene is used for many purposes, such as for the manufacture of containers, electrical insulation, housewares, chemical tubing, toys, freezer bags, flexible ice cube trays, and battery parts. However, polyethylene is extensively used as a packaging material in a variety of applications, approaching 65 % of total polyethylene consumption being 170,000 tons at present, then growing to 300,000 tons in next five years. The

consequent increases in the plastic fraction of the municipal solid waste stream and the associated urban plastic litter problem causes serious disposal problems. The destruction of this requires expensive equipments. To overcome these problems, degradable plastics must be developed. The most frequently used approach is the introduction of sensitizers or initiators into the polymer. Ketone and quinones have been used for this purpose. These compounds absorb light at wavelengths near 300 nm, thus being reactive in the solar UV range. On natural exposure, the degradable plastics will be self-destructing very rapidly because of the effects of sunlight, humidity, rainfall and soil bacterias. It is expected that the application of photodegradable plastics as packaging materials would solve the growing problem of waste disposal.

The objective of this work is to study the method of rendering polyethylene film, both LDPE and HDPE, photodegradable by incorporating sensitizers into the polymer. The natural weathering test of PE with and without additives was investigated and compared to the irradiation by medium pressure mercury lamp. The change of mechanical properties and absorbance properties with fourier-transform infrared adsorption (FT-IR) measurements are observed. Mechanical measurements are suitable and sensitive enough tools for observing the degradation process. The FT-IR measurements provide a more or less average value of the change of the functional group content characteristics of the formation.