



## Chapter 1

### Introduction

The discovery of natural gas in the Gulf of Thailand had major influence on the country and prompted the utilization of this resource for domestic petrochemical production and created investment opportunities for the petrochemical industry in Thailand with the aim to maximize the utilization of natural gas. The First Petrochemical Complex, known as NPC I, was proposed and integrated as part of the Eastern Seaboard Development Program. The first complex, consisting of one upstream unit for producing intermediate monomers and four downstream units producing final products of LDPE, HDPE, VCM/PVC and PP has been followed by a Second Petrochemical Complex, known as NPC II which will be producing of PE, PP, PVC, PS, ABS, SBR and Polyester by using mainly condensate and refinery naphtha as feedstock. If these complexes are complete, the annual production will be  $12.6 \times 10^5$  tons for all types of polymers with  $3.45 \times 10^5$  tons or 27.1 % PE.

Polyethylene is the major member of a group of chemical compounds known as polyolefins. It is one of the most widely polymer among the thermoplastic materials. Polyethylene is produced in various forms in terms of density : low , intermediate , and high density polyethylene. It may be obtained in granules, powders , films , rods , tubes and sheets and molded products through such processes as injection molding, fluidized bed coating, blow molding, extrusion, vacuum forming, casting and calendering.

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,

snap-on lids and battery parts. High density polyethylene is used extensively for bottles and containers because of its ease of processing, toughness and economy.

The problem of waste disposal is increasing with the use of increasing amounts of plastic materials. Organized recovery presently exists only in the case of production wastes inside polymer factories. In domestic garbage there is an ever increasing portion of plastic wastes, the destruction of which requires expensive equipment. Protection of the environment requires improved packaging materials which are self-destructing which will be degraded very rapidly when exposed to the effects of sunlight, humidity, rain fall and soil bacterias. It was expected that polymers degrading under the influence of the atmospheric agents would solve the problem of waste disposal.

The purpose of this work is to study the manufacture of environmentally safe high density polyethylene by incorporating photosensitizers into the polymer. The progress of photodegradation of PE and the effect of anthraquinone and benzophenone sensitizers was studied by observing the change of mechanical properties and absorbance properties with fourier transform infrared absorption (FT-IR) measurements. The FT-IR measurements provide a more or less average value of the changes of functional group content characteristics of the formation and/or depletion of important structures modified during degradation. Mechanical measurements are suitable and sensitive enough tools for observing the photodegradation process.