CHAPTER I
INTRODUCTION

In contemporary life, plastics have become indispensable materials. Due to their many advantages, plastics are replacing many natural products, such as banana leaves, which several decades ago were widely used as a practical packaging material for traditional Thai food. However, plastics also have certain disadvantages, such as being derived from non-renewable resources and their difficulty as well as high cost of recycling.

Polypropylene (PP) is one of the most widely used plastics. The wide range of properties that PP has to offer makes it an extremely versatile material. It can be made to be flexible or very stiff, tough or very strong, transparent or opaque. PP is used for a huge variety of applications, for example, fibers, spunbonded nonwovens, tapes, film and sheet, board, tubes and blow moldings, and for all sort of injection molded parts. However, an important application of PP is as packaging materials. Therefore, PP is present in various amounts in all types of waste: around 15% found in household waste (mainly as packaging); 10 to 15% present in commercial waste (packaging); 5 to 10% of the light fraction-known as fluff-from shredded cars (currently cars contain around 20 kg of PP by average); less than 5% of the light fraction of electrical scrap (Brandrup *et al.*, 1996).

An undesirable consequence of this widespread use of PP is that it creates a lot of waste materials and then environmental problems. Plastic films are usually disposed by either landfilling or incineration. In both cases, the plastic films are totally destroyed due to their small volumes which are unattractive for recycle industry.

Pyrolysis is a viable alternative to landfilling and incineration for utilizing waste plastic film. In this way, plastic waste materials can be converted into monomers, fuels, and valuable chemicals. Furthermore, the products of pyrolysis can also be used as a source of raw materials, replacing natural gas or petroleum.

One problem in the pyrolysis of waste polymers for chemical recycling is that the degradation of macromolecules occurs at quite high temperature and thus requires a considerable amount of energy. By pyrolysis, the waste plastics can be thermally or catalytically degraded. In the thermal degradation of polyolefins, many hydrocarbons having a wide distribution of carbon atom numbers are formed. In contrast, the oils produced by the catalytic degradation are known to contain a relatively narrower distribution of hydrocarbons. In addition, catalytic degradation has an advantage of a lower temperature of degradation than thermal degradation.

The objectives of this work were to investigate whether or not the number of reprocessing had the effect on pyrolysis products and to study the effect of catalysts on pyrolysis products of PP films. The influences of number of reprocessing on mechanical, rheological and thermal properties of PP films were also studied. Catalyst characterizations were also performed to investigate physico-chemical properties of catalysts affecting different product distribution and activity on catalytic cracking of PP film.