CHAPTER I

INTRODUCTION

Lifestyle of modern world leads to dramatic increase in plastic consumption. Variety of plastic products provides a fundamental contribution to our daily activities such as building materials, packaging materials, equipment, to name a few. However, plastics also have certain major disadvantage on their difficulty and cost associated with plastic wastes management. These have led to generation of enormous amounts of plastic wastes. One of the possible ways to solve this problem is the introduction of natural, low cost, and easily biodegradable additives such as starch or cellulose into plastics to increase their susceptibility to environmental degradation.

Polypropylene (PP) is one of the most widely used biodegradable additive-based composite. Starch is already added in polypropylene on an industrial scale. Nevertheless, many researches are devoted to other biodegradable materials such as microcrystalline cellulose.

Common ways to deal with plastic wastes are landfill and incineration. However, these methods are not sustainable solutions. Locating suitable places for landfill has become more difficult because of resistance by the nearby populations and lack of available space in many regions. In many cases, landfill would result in contamination of soils and underground waters. Moreover, unlike organic substances, even biodegradable plastic would still require at least 3 months for 50% weight loss during soil and fungus ageing (Zuchowska *et al.*, 1997). Incineration is also not an environmental friendly option due to the generation of unacceptable emissions of gasses and dusts as well as odor problems.

The other alternative on utilizing plastic wastes would be the substoichiometric thermal conversion technology, namely pyrolysis and gasification. Pyrolysis is a thermal decomposition of materials in the absence of oxygen/air or in an inert atmosphere at elevated temperature to break their structure into smaller fractions. This process differs from the conventional incineration because it can be applied to transform plastic wastes into various products depend on the type of plastics, residence time, temperature, and

type of reactor used in the process. It allows the recovery of chemicals with added value, which can be used as fuels replacing petroleum products or as raw materials in several industries.

Literature reports several researches on thermal degradation by pyrolysis of plastics that has physically mixed with other biodegradable materials to simulated municipal solid waste (Alvarez and Vazquez, 2004; Sharypov *et al.*,2002; Matsuzawa *et al.*,2001; Jakab *et al.*,2000). But researches on pyrolysis of biodegradable composites of plastic are scarce.

The aim of this work is to investigate the effect of type and amount of biodegradable additives on pyrolysis products yield. Specifically, pyrolysis process of polypropylene-starch and polypropylene-microcrystalline cellulose based composites of various compositions are performed. Moreover, the apparent kinetic parameters (E_a, k_0, n) are also considered (Girija *et al.*, 2005).