CHAPTER I

INTRODUCTION

In recent years, polymer based composites reinforced with a small percentages of fillers can significantly improve the mechanical, thermal and barrier properties of the pure polymer. These composites are now being considered for a wide range of applications including packaging, coating, electronic, automotive and aerospace industries [Wu et al., 2002; Mahfuz et al., 2004]. Most of fillers for making composite are carbon nanotube, carbon fiber, carbon filament, etc. which have high strength but expensive and complicated production process. Therefore using catalytic coke as the filler to improve the mechanical properties of polymer is interesting. Regarding to catalytic coke is by product after the reaction which can be used to increase the value.

The rationale for selecting polypropylene was because of its wide spread industrial applications in housewares, packaging, pipes and automotive parts e.g. battery cases and bumpers. Moreover, it was resistant to moisture, corrosion, wear, chemical reaction and extremely low cost [Wu et al., 2002; Wang et al., 2004; Manchado et al., 2005].

In this research, the main purpose is to synthesize catalytic coke at various reaction times, to prepare catalytic coke/polypropylene composites by melt processing in a twin screw extruder. The effect of catalytic coke on the mechanical properties of composites was investigated. The results were then compared to those obtained for composites containing fresh catalyst ($Ni/SiO_2.MgO$ catalyst) as a filler. The scopes of this study are as following:

1. Catalytic coke was synthesized by methane decomposition using $Ni/SiO_2.MgO$ catalyst. The reactor was evacuated and filled with Argon (Ar) to create an inert atmosphere. Methane (CH_4) and hydrogen (H_2) were introduced into the reactor. The reactor was then heated to 800 °C by varying reaction time to 60, 80, and

100 min. Characterize the obtained catalytic coke using SEM, XRD, TGA, BET surface area.

2. Catalytic coke/polypropylene composites were prepared using melt processing using a twin screw extruder at the processing temperature of 200 °C. The extrudates from the extruder were palletized. Composites based on PP containing 1, 2 and 3 wt% of catalytic coke were prepared. The specimens for mechanical characterization were compression molded. The mechanical properties of catalytic coke/PP composites were evaluated using Universal testing machine.

This thesis is divided into five parts. The first three parts describe general information about the study, while the following two parts emphasize on the results and discussion from the present study. The background and scope of the study are presented in Chapter I. Chapter II and Chapter III consist of the theory and literature review, while the experimental systems and procedures used in this study are shown in Chapter IV. The experimental results, including an expanded discussion, are given in Chapter V. Finally, in the last chapter, the overall conclusion from the results and some recommendations for future work are presented.