CHAPTER I

INTRODUCTION

Although Thailand is known as an agricultural developing country and the world's largest rice exporter, the manufacturing sector is now leading agriculture in proportional contribution to gross domestic production (GDP). The several small plastic processing plants were established only two decades ago to produce the finished products for household use in the domestic market. After the discovery of abundant supplies of natural gas in the gulf of Thailand, the large scale multi-billion dollar project has occured in Thailand. Consequently, it has been a highly attractive business opportunity for a completely "full chain" petrochemical industry. The petrochemical development in Thailand has recently provided a momentum in the past dacade that may change the status of the finishing products consumer to the basic raw materials manufacturer.[1]

1.1 The Roles of the Polymer Composite Materials

Plastics are parts of everyday life and contribute immensely to the benefit of humanity. The motivation for the rapid growth is the suitability of plastics for mass production, which depends mainly on their easy and reproducible shaping, and their low volume cost, coupled with some attractive properties. The users are now more demanding in their request for specific properties of new materials.

Moreover, the price of petrochemical feedstock has been increased. For these reasons, composite material is one of the interesting choices to improve the performance of the plastic. Composites are combination of two or more materials present as seperate phase and combined to form desired structures so as to take advantage of certain desirable properties of each component. The realization that reinforced and filled plastics are becoming an increasingly important factor in technical applications and is being reconized to an ever growing extent. These composites contain fillers and reinforcments for enchancing the properties and lowering the cost of moulding compound. Table 1.1 shows the estimated filler consumption in plastics (USA) from 1980 to 1990.[2] The higher usage of organic fillers in each year indicates the increased trend in the future.

The rising cost of petrochemical feedstocks and the need to enchance mechanical property have stimulated research into increasing the use of relatively cheap fillers and reinforcing agents. In certain area of application, the density of the fillers is a factor of primary importance. Wood flour has been suggested as a filler for polymeric system by virtue of its comparatively low price, low density, (especially in comparison with mineral substances), low abrasion, and its abundance and independence of oil. Current applications for the wood flour/polypropylene composite include automotive interior panels and electrical cable reel, but potential uses include other automotive parts, furniture, and paneling for boats, railroad cars, campers, and building interiors.[3]

Table 1.1 Estimated Fillers Consumption in Plastics (USA).

Filler/Reinforcement	1980 (1000 t)	1985 (1000 t)	1990 (1000 t)
Carbonates	1100	1780	2900
Silicates			
Talc	110	180	300
Asbestos	235	300	365
Kaolin	76	100	130
Mica	0.5	0.5	0.6
Miscellaneous	8	13	21
Silicon dioxide	40	75	140
Various minerals	11	13	15
$Al(OH)_3$	150	210	295
Carbon black	28	32	36
Organic fillers(nut shell, wood flour, corn cobs, etc.)	105	140	187
Glass fibers	455	670	980
Glass spheres, hollow glass spheres, etc.	7	15	31
Carbon fibers, aramide fibers, whiskers, etc.	1.2	2.5	5.5
Total	2326.7	3531.0	5406.1

1.2 Objectives of the Research Work

1) To fabricate wood flour-filled polypropylene composites by using two roll mill and compression moulding.

2) To study the effects of wood flour content on the mechanical properties of polypropylene composite.

3) To compare the mechanical properties of untreated and treated wood flour composites.

4) To study the fracture surface of the composites.

1.3 Scopes of the Research Work

In this work, an evaluation of sawdust obtained from waste in wood manufacture has been taken. It is used as filler in polypropylene matrix. The interfacial adhesion is the main parameter affecting the properties of composite, because of the poor adhesion between the polar wood and nonpolar polypropylene. So, coupling agents have been filled to improve the wood flour/polypropylene interphase. The effects of surface modification or coupling agent on the mechanical properties are observed. This research work covers the following topics.

1) Investigation of the effects of different coupling agents and amounts of filler on the mechanical properties of wood flour filled polypropylene composites.

2) Determination of the optimum Epolene E-43P concentration to make the wood flour filled polypropylene composite to posses high working properties.

3) Determination of the best coupling agent for the wood flour filled polypropylene system.

4) Proof of the interfacial adhesion between the wood flour filler and the polypropylene matrix.