

CHAPTER I INTRODUCTION

Wood Plastic Composite is composite material that made of plastic or recycled plastic and wasted wood. WPC consists of thermoplastic polymer such as polypropylene, polyethylene, polyvinyl chloride, etc. blended with wood wastes in various mixture ratios for 20:80 wt% until 55:45 or a little bit more.

WPC is used for a wide variety of applications including windows, door frames, interior panels in cars, railings, fences, landscaping timbers, cladding and siding, park benches, molding and furniture. (wood composite primer, 2009)

WPC is the most environmental friendly among other building materials because it is made from residue wood or recycled plastic so the net carbon emissions are very low that shown on bellow table. Compare to steel, the household product made of wood have a net carbon emission lower.

Table 1.1 Cabon Emission from Two Minneapolis Homes (Lippke et.al. 2004)

Carbon Emissions from Two Minneapolis Homes (metric tons)		
	Wood Frame House	Steel Frame House
Carbon emissions during manufacture, use, and demolition	434	443
Carbon sequestered in wood products	489	258
Net carbon emissions	(55)	185

WPC offers a number of potential benefits. Compared to pure wood materials, WPC has lower cost, lower water absorption, lower maintenance requirements, high compression loaded, and greater flexibility in shape and color.

However, WPC is quite heavy and not as stiff as solid wood. Sunlight can damage colours faster when adding wood into thermoplastics, and whitening or graying of the surface tend to be occurred.

Table 1.2 Glass temperature, melting temperature and density of thermoplastics

polymer	T _g (°C)	T _m (°C)	Density (g/cc)
PP	-10	170	0.905
HDPE	-120	135	0.944 - 0.965
LLDPE	-133 to -103	124	0.917 - 0.930
PVC	85	240	1.38

From Table 1.2, considering the density of 4 types of thermoplastics usually used as WPC materials. PVC gives WPC with the highest weight compared PP, HDPE, and LLDPE with the same wood content. On the other hand, only PVC shows the glass transition higher than room temperature meaning that WPCs fabricated from PP and PE are softer. When considering the melting temperature, PVC requires the highest heat to melt in extrusion or injection process. The shape of PVC is more stable than PP and PE because its glass transition temperature is above room temperature.

However, many countries in the world, especially in Europe, have strongly concerned about environmental issues. When PVC absorbs the sunlight, the oxidation reaction can be occurred, causing the releasing of poisoning HCl gas into the atmosphere. Thus, PP and PE are more environmentally friendly than PVC.

For outdoor applications, all polymers, especially PP, can be degraded by the sunlight. To prevent degradation of polymers, the UV-stabilizer is usually added.

Calcium carbonate is suitable filler since it has low cost. The surface of calcium carbonate can be treated with stearic acid to improve the interfacial adhesion between filler and polymer matrix. (Y.W. Leong et. al, 2004)

The purpose of this work is to fabricate WPC from PP and waste wood by using acrylic acid monomer as a coupling agent for PP and wood flour since acrylic acid monomer is easily available and has reasonable price and then characterize the mechanical and chemical properties and water absorption of wood plastic composite.