CHAPTER 1

INTRODUCTION

1.1 Background of the Study

The study of wood plastic composite (WPC) become one of essential products in the industry nowadays. WPC can simply defined as a mix of material consists of natural wood and thermoplastic. Furthermore, WPC is eco-friendly product, which the durability achieved without using toxic chemicals (Alireza, 2008). Wood recycle plastic composite (WrPC) is a product that use recycle plastic in order to minimize environmental impact and consumption of virgin plastic. Most of industry claimed that the process of making WrPC is elementary and the products are commercialize (Alireza, 2008).

To cut the cost and municipal solid waste (MSW), plastics material have been used in the production of wood composite by blending it together with wood powder. For instance, recycled materials such as recycled high-density polyethylene become a value added in the manufacturing of WrPC without slacking off the properties. Wood powder is renewable resources and abundance in nature. Thus, it possesses high potential that can be used in the making of WrPC as it can show better performance of mechanical strength, wettability and good thermal insulation (Saba et al., 2015).

Besides, WPC can be used in wide range of applications such as decking, building and structural components. Generally, wood powder comprise between 50 to 70 percent of the production wood plastic composite. The most common type of wood that been used is kenaf. This kind of wood is easily obtain and low in cost. Many research proved that
kenaf possessed excellent mechanical strength and thermal properties compared to other type of natural fiber (Saba et al., 2015).

In the awareness of green technology, recycle plastic such as polyethylene is used to produce WrPC. A study had shown that the properties of recycle polyethylene (rPE) are not largely different from virgin plastic and suitable for many applications. Moreover, nanoclay has its own special properties and perfect atom arrangement that suit it as reinforced polymer-based composites (Kin et al., 2006). According to Kin et al. (2006), it is one of the good mineral filler to overcome the drawback or failure of WPC.

The process of making WrPC been done by blending fine wood particles with recycle polyethylene in order to make firm, smooth sample for convenient handling and further processing. The addition of nanoclay can enhance the mechanical properties of material. Moreover, to improve the compatibility and bonding between wood flour and recycle polyethylene, maleic anhydride polyethylene (MAPE) was used as coupling agent.

1.2 Problem Statement

Recently, the market of wood plastic composites had grown higher and it becomes trending, as the product is environmentally safer with better performance in any applications. Virgin thermoplastic become one of the materials used in WPC. Recycle plastic that can melt and process below the degradation temperature of wood or any lignocellulos fillers suitable in production of WPC (Nourbakhsh et al., 2009). In the meantime, most industry had changed the manufacturing of wood plastic composite (WPC) to wood recycle plastic composite (WrPC) because the used of virgin plastic was exceeded and the cost was high. Accordingly, recycle plastic polyethylene was applied in this study to prepare wood recycle plastic composite in the basis of kenaf to minimize the cost.

Besides reducing the cost, recycle plastic polyethylene (rPE) offers an excellent dimensional stability as compared to virgin plastic polyethylene (Hua et al., 2012). The
mechanical properties such as tensile and flexural strength of recycle polyethylene wood plastic composite are equivalent to virgin polyethylene composite. Moreover, recycle plastics are cheaper and can reduce the environmental impact. However, the study of WPC based on recycle polyethylene is very limited. According to Yam et al. (1990), the performance of recycle high-density polyethylene (rHDPE) and wood fiber composites is good as virgin plastic composites. The advantage of natural fiber such as kenaf is it shows superior flexural strength and modulus of elasticity but have some drawbacks such as fiber degradation can occur at high temperature (Yam et al., 1990).

Mineral filler like nanoclay employed in this research was to address the issue of WrPC such as poor impact strength, tensile strength and flexural strength. This filler met the expectation of improving mechanical properties of resulting product. In this study, a WrPC was prepared using kenaf wood flour and recycle polyethylene. This study is to improve mechanical properties of WrPC for structural and non-structural applications.

1.3 Objectives of Research

This work aimed to produce kenaf wood flour, recycle polyethylene, maleic anhydride polyethylene and nanoclay with outstanding mechanical and thermal properties. Thus, several objectives listed as below:

1. To prepare wood recycle plastic composite using kenaf powder, recycle polyethylene, maleic anhydride polyethylene and nanoclay filler.
2. To characterize mechanical properties, thermal properties and morphology of the resulting WrPC.
3. To compare the mechanical properties of WrPC without the addition of nanoclay and WrPC in the presence of nanoclay filler.