

## CHAPTER 1

### INTRODUCTION

#### 1.1 Introduction

Composite materials are a combination of two or more materials on a macroscopic scale that produce new materials that are stronger than individual components. The advantages of composites are strength, high stiffness and lightness. Composite materials consist of matrix and reinforcement. Usually reinforcement has a stronger and stiffer properties than the matrix. Reinforcement is usually fiber or particulate. composite particulates have the same dimensions in all directions and shapes of particulates may be spherical or irregular geometries. (Materials & Campbell, 2010)

A polymer is a long series of atoms and is produced from the junction of several other molecules called monomers. These monomers may be similar, or may also have one or more chemical elements replaced. In general, polymers are divided into three main categories, thermoplastics, thermosetting and elastomers, and most thermoplastics are often used because thermoplastics can be recycled. Thermoplastic polymers can be divided into two categories, line amorphous and crystalline or can be called (semicrystalline). Polymer Matrix Composite (PMC) consist of an organic polymer matrix bound together with a diversity of continuous or short fiber. Polysiloxane or silicone rubbers are the most common organosilicon polymers used in polymer chemistry and they have excellent performance of high temperature resistance, chemical inertness, and magnificent dielectric properties. (Petrucci & Torre, 2017)

Rice husks are agricultural wastes obtained from rice milling process. Rice husk contains silica purity can be as high as 90-98%. The ash content of rice husk and sodium silicate content in the ash become economical to extract the silica from rice husk ash. The benefits of rice husk are overwhelming, besides the richest raw materials of rice husk silica can also be used as agricultural fertilizers, cement additives, and fabrication of concrete. Rice husks generated from rice mills usually cause disposal problems, rice husks are usually burnt and disposed of without being put to good use. (Patil & Meshram, 2014). There are three processes for obtaining silica from rice husks, the first method of hull treatments with hot organic acid solutions before being burned, the second method with boiling water both using automatic chloride at temperatures close to 150c, the third method, does not remove the alkaline element from hull. (Souza & Persegil, 2002). In this project, Polymer matrix Composite will be fabricated by using compression moulding. Polysiloxane will act as the matrix and rice husk silica as the reinforcing material.

## **1.2 Problem Statement**

In the development of advanced composite technology has a very important role. The use of composite materials evolves mainly in engineering, because composites have advantages such as lightness, high strength and stiffness. The process of making composite materials more efficient, but the problem in the application of composite materials is the cost, because the raw material is still expensive.

Rice husk is agricultural waste that usually burned, discarded and not utilized properly. This will increase environmental pollution because of the hazardous chemical content. Therefore, use rice husk wisely, such as converting rice husks into silica for strengthening composites body.

Polysiloxane is weak as a single body, but polysiloxane has the properties of high temperature resistant and electrical resistant. Polysiloxane also has weak physical and mechanical properties. Addition of fillers to polysiloxane will improve its properties and obtain polymer matrix composite. Lastly, the purpose of this study is to determine the strength and comparison between polysiloxane and rice husk silica, and change the physical and mechanical properties of the new material composite.

### 1.3 Objectives

The main purpose of this research are :

1. To fabricate polysiloxane filled rice husk silica composites using compression moulding
2. To investigate the effect of different silica from rice husk ash addition to polysiloxane composite

### 1.4 Scope of Study

Scope of research are as follows :

1. The materials used is rice husk ash as reinforcement and polysiloxane as matrix
2. Fabrication of polysiloxane filled rice husk silica using via compression molding
3. Polysiloxane filled with rice husk silica at composition of 0wt%, 2wt%, 4wt%, 6wt%, 8wt%, 10wt%, and 12wt%
4. The samples are characterized using X-ray Fluorescence (XRF), X-ray Diffraction (XRD), Fourier Transform Infrared (FTIR) and Scanning Electron Microscopy (SEM).
5. Analysis of physical properties and mechanical properties of polysiloxane filled with rice husk silica composite using density test and tensile test

## **1.5 Expected result**

In this study, by burning rice husk at temperature 700 °C for 8 hours the high purity silica will be obtained. Composite body is successfully fabricated through compression moulding by using material polysiloxane and material rice husk with composition 0wt% to 12wt% silica in composite body. By adding fillers in polysiloxane will be improve the physical properties and mechanical properties of composite. The characterisation of polysiloxane and rice husk silica and composite body will be identified using X-Ray Fluorescence (XRF), Fourier Transformation Infrared Spectroscopy (FTIR), X-Ray Diffraction (XRD) and Scanning Electron Microscopy (SEM). The properties of polysiloxane filled with rice husk silica composite such as physical properties will be identified using density test. The strength of material polysiloxane filled with rice husk silica composite will be identified by using tensile test.