CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

This methodology chapter will discuss about the research methodology or workflow that will be implementing through this project. In the first part of this chapter, we are going to discuss about the project flow chart. This project flow chart is showing the step by step of each process that will be done during this project starting from the preparation of the raw material until the characterization and mechanical testing.

3.2 PROJECT FLOW CHART

As we know, powder metallurgy process involves three basic steps which are mixing and blending, compaction and sintering. But in this project, the powder metallurgy process involve six step which start from prepare the raw material which is aluminium and silicon carbide powder. The both material are prepared with different weight percentage composition. After that, it continues with the blending process. After the powders are blend together, it will be compacted into a cylindrical steel die with different compaction of load by using hydraulic press machine. After the compaction process, the specimen will undergo the sintering process in a fixed temperature 500°C. Finally, the specimens will be testing in two categories which are hardness test and
microstructural analysis. The hardness test is using the Vickers Micro-Hardness Test while the microstructural analysis will be investigated by using the optical microscope. Figure 3.1 below shows the project flow chart.

Figure 3.1: Flow chart of powder metallurgy process
3.3 MOULD CAVITY

For compaction process of this powder metallurgy method, the shape of die and punch are varies. There are some of die and punch in square and rectangular shape and commonly the shape is in solid cylindrical pins.

On this project, the cylindrical die and punch using is 30 mm diameter and 40 mm length of steel is fabricated. There are using the die and punch which the punch was introduced from the top and pressed using arbor press.

![Figure 3.2: Picture of die and punch use in compaction process](image)

**Figure 3.2:** Picture of die and punch use in compaction process

Sources: Russo (2014)

3.4 PREPARE RAW MATERIAL

The aluminum and silicon carbide powders of specific size are differentiating after complete the sieve analysis. After that, both powders will be weighed individually or separately with their own composition by using the digital weight balance. The weights of those powders are calculated based on their molecular weight. Aluminum has 26.89 g/mol while the silicon carbide has 40.09 g/mol. The powder mass ratio is 4:1.