EFFECT OF DIFFERENT PRESSURE ON DENSIFICATION OF SINTERED PARTS

AQIL BIN ABDUL WAHAB

(2002242115)

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Faculty of Mechanical Engineering

Universiti Teknologi MARA (UiTM)

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ABSTRACT

Pressure during compaction is the most important parameter in powder metallurgy application since it contributes to the physical and mechanical property of the part. This study attempts to investigate the effect of different compaction pressure on densification of sintered part and the characterization of ceramic powder in term of flow rate and powder packing density were included. Two types of ceramic powders were used in this study; alumina 9620 with 3% of acrylic binder denoted as NM 9620 and alumina 99 with 4% of acrylic binder denoted as NM99. Experimental works were carried out for a simple cylindrical die of compacted powder using a conventional compaction machine at room temperature. In this study, 5 compaction pressure levels were applied; 2, 4, 6, 8 and 10 tons then undergo sintering process at 1620°C and further investigation was made in term of density and dimensional changes. This provides information on the characterization of powder, compacted or green density and sintered density that been achieved from the ceramic powders used. It clearly shows that increasing compaction pressure result in increasing both densities of green and sintered part. It is shown by additional volume fraction of the binder result in greater shrinkage. In characterization of ceramic powder, smaller particle size offers higher flow rate and tap density but lesser in apparent density. Spherical particles despite their high apparent densities have poor compaction properties due to weak bonding among them.

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CHAPTER 1

INTRODUCTION

1.0 Introduction of powder metallurgy

Powder metallurgy has become a popular technology nowadays and is widely used in various industries especially in automotive industry. The advantages of powder metallurgy processing for a wide range of composite applications include low cost, complex shapes, alloy flexibility and wide range of reinforcement levels.

Powder metallurgy is a fabrication technique which fine powdered material are blended or mixed then compacted into a desired shape and followed by heat treatment to bond the contacting surface. The powders mixture is then compacted in a closed die using a pressure depending upon the strength and ductility of material being used. The compacted is then sintered, that is heated generally below the melting points of the powder used. This treatment produces a mechanically strong material as the particles bond together across the interface where only limited adhesion was effected by compacting [1]. The basic step of powder metallurgy is listed below:

1. Blender / Mixing Powder
2. Compaction Process
3. Sintering Process
4. Finish Product