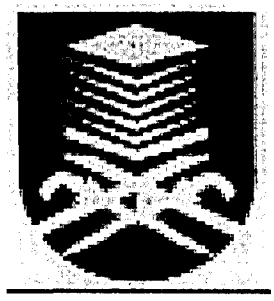

# ANALYSIS OF THERMO-MECHANICAL BEHAVIOR FOR CERAMIC POWDER DURING COLD AND WARM COMPACTION PROCESSES

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## ABSTRACT

The thermo-mechanical behavior of alumina ceramic powder during cold and warm compaction processes was studied. The mechanical characterization such as green density, sintered density and linear shrinkage of the sintered compacted alumina ceramic powders were included in the study. The effect of sintering temperature towards the density also was studied. Experimental works were carried out in the laboratory for a simple cylindrical of compacted powder using a uniaxial die compaction machine. The parameters which were measured were force and displacement. This will provide information on the tooling movement and the required force for compaction of powders. The density and linear shrinkage is obtained by measuring the dimensions of the green compacted powder and sintered compacted powder. Two types of powder are used which is pure alumina (N0115) and alumina with acrylic binders (NM9620). The experimental work results were discussed in order to find the reason for such behavior and characteristic. From the compaction results, compaction at $150^0$C indicate that less force is needed to compact powder compare to compaction at room temperature. Both green and sintered density of compaction temperature at$150^0$C is higher and relatively close to the theoretical density. Linear shrinkage indicates that diameter shrinkage will increase as the sintering temperature increases for both powders. For powders compacted at room temperature, the height shrinkage will increase as the sintering temperature increased but for powders compacted at $150^0$C, the height shrinkage will decrease as the sintering temperature increased.

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# CHAPTER I

# INTRODUCTION

## 1.1 Alumina Ceramic

Alumina is a very versatile engineered ceramic material because of its high temperature service limit along with its useful properties for having high melting temperature, chemical, electrical resistance and hardness. The powder can be produced cheaply in massive quantities which lead to the diversity of alumina ceramic products with different properties. Most of the alumina is used in producing refractory, abrasives, white wares and engineering ceramics such as refractory bricks, sliding gates valves, hip prostheses, computer substrates, grinding media and electrical insulator. Another thing is that alumina can be easily formed and finished using a number of fabrication methods. In order to enhance its properties or fabrication, it is often compounded with silica or trace elements and commonly will range 92% to 98% alumina.