CHAPTER 5

CONCLUSION

Based on the results obtained for 6061 aluminium compacts produced through powder metallurgical technique, by varying the aluminium particle sizes, varying the cooling temperature after sintering and by using TiC as hard particle reinforcements, the following conclusions were arrived.

5.1 VARYING ALUMINIUM PARTICLE SIZE

- As the aluminium particle size is reduced from 150 microns to 800 nano, the porosity level decreases and density increases for a particular compaction pressure.

- Irrespective of the aluminium particle sizes, optimum compaction pressure is 550 MPa which gives better micro hardness and tensile strength values.

- Optimum microhardness and tensile strength values of 80VHN and 152 MPa for a compaction pressure of 550 MPa.

- Microhardness and ultimate tensile strength for fully heat treated aluminium compacts with aluminium particle size of 800 nm are higher in comparison with aluminium particle size 20 μm and 150 μm.

- As the compaction pressure increases beyond 550 MPa, the ejection pressure leads to the formation of internal cracks due to friction.
between the aluminium powders and die wall surfaces and between the aluminium particles itself.

5.2 VARYING FURNACE CONTROLLED COOLING AFTER SINTERING

From the microstructures obtained for the specimens while varying the furnace cooled temperature from 600°C to 200°C after sintering, it is observed that the pore size gets reduced, as the furnace controlled homogeneity in distribution of TiC hard particles along the aluminium particle size of 800nm, 600nm, 900nm and 1200nm, non prolonged sintering duration(60min, 90min and 120min), non optimised density, microhardness and tensile strength values are found. With prolonged sintering time of 600°C to 200°C after sintering, improved density, microhardness and tensile strength properties are observed for 800nm aluminium particles when compared with 600nm aluminium particles.

5.3 VARYING PERCENTAGE OF TiC REINFORCEMENTS WITH ELEMENTAL 6061 ALUMINIUM ALLOY

Varying the percentage of TiC (1%, 5% and 10%) particles and prolonged sintering duration(60min, 90min and 120min), pores are formed around the TiC particles, due to which the porosity level increased as the percentage of TiC particles is increased beyond 5%. Hard particles is increased beyond 5%.

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As the volume percent of TiC increases, the volume of pores formed increased, resulted in decrease in tensile values as the % of TiC increases beyond 5%. Optimum tensile strength value is obtained for 5% of TiC reinforcements which varies from 80 MPa to 86 MPa as the sintering duration increases from 60 min. to 120 min.

5.4 MICROHARDNESS ANALYSIS USING ANN

Back propagation with adaptive learning rate algorithm of artificial neural network was trained using the prepared training set which was recorded by the experimental values. Artificial Neural Network has found successful improvement in prediction of micro hardness for a powder metallic 6017 aluminium compacts. The error was found to be zero at about 3000 epochs.
5.5 SUGGESTIONS FOR FURTHER STUDY

1. Influence of TiC particle size and aluminium particle size of Al – TiC composites on dry sliding friction and wear behavior may be studied.

2. The age hardening characteristics of aluminium alloys are generally modified by the introduction of ceramic reinforcement. Hence, the age hardening characteristics of Al – TiC composites may be studied.

3. Coefficient of thermal expansion of Al – TiC composites may be studied and compared with Al-Si alloy.

4. Optimisation of process parameters such as sintering temperature along with sintering duration of Al – TiC has little concentration.