

## ABSTRACT

This research focused on the study of the influence of different sintering temperature of physical and mechanical behaviour of Aluminum Metal Matrix Composites (Al MMC) reinforced with alumina ( $\text{Al}_2\text{O}_3$ ). Al MMC reinforced with rigid ceramic particulates have become increasingly important for structural applications in aerospace, automotive and other transport industries, because of their high specific strength and modulus, good wear resistance as well as ease of processing. In this project, the influence of sintering temperature was investigated on its hardness and microstructure. These Al MMCs have been traditionally fabricated by powder metallurgy (PM) method. There are three main steps in PM which are blending, compacting and sintering. The experiments were performed on 10% weight percentage of  $\text{Al}_2\text{O}_3$  on different sintering temperature. In this study, five specimens of the composite were sintered with different temperature which are 400 °C, 450 °C, 500 °C, 550 °C, and 600 °C. Then, the influence of different sintering temperature on physical and mechanical behavior of the composite was studied. The specimens were investigated on their hardness and microstructure. The hardness of the composites was examined using Vickers Hardness Test and Image Analyzer was used to study the microstructure of the composite. The result shows that the hardness of the composite decreased with the increasing of sintering temperature. Then from the microstructure observation, the grains of alumina increased when the sintering temperature increased. Furthermore, the result of this study also was compared with the other published work, and it shows the correlation each other.

## ABSTRAK

Kajian ini tertumpu kepada pengaruh suhu pensinteran yang berbeza terhadap sifat-sifat fizikal dan mekanikal komposit matrik aluminum (Al MMC) yang diperkuat dengan alumina. Al MMC yang diperkuat dengan partikel seramik menjadi semakin penting untuk aplikasi struktur dalam aeroangkasa, otomotif dan lain-lain industri pengangkutan disebabkan oleh kekuatannya yang khusus dan modulus yang tinggi, sifat tahan haus yang baik dan juga mudah diproses. Dalam projek ini, pengaruh suhu pensinteran telah dikaji terhadap ketahanan dan mikrostruktur komposit. Al MMC ini telah dihasilkan melalui kaedah serbuk metalurgi. Terdapat tiga langkah utama dalam kaedah serbuk metalurgi iaitu pengisaran, pemampatan dan pensinteran. Beberapa eksperimen telah dijalankan ke atas 10% berat  $\text{Al}_2\text{O}_3$  bagi setiap suhu yang berbeza. Dalam kajian ini, lima spesimen komposit telah disinter dengan suhu yang berbeza iaitu  $400\text{ }^\circ\text{C}$ ,  $450\text{ }^\circ\text{C}$ ,  $500\text{ }^\circ\text{C}$ ,  $550\text{ }^\circ\text{C}$ , dan  $600\text{ }^\circ\text{C}$ . Selepas itu, pengaruh perbezaan suhu ke atas sifat fizikal dan mekanikal komposit dikaji. Ketahanan komposit dikenalpasti menggunakan Ujian Ketahanan Vickers. Manakala analisis imej digunakan untuk mengkaji mikrostruktur komposit tersebut. Daripada eksperimen yang telah dijalankan, didapati bahawa ketahanan komposit menurun berbanding dengan kenaikan suhu pensinteran. Kemudian melalui pemerhatian mikrostruktur pula, butir-butir alumina menjadi semakin besar apabila suhu pensinteran meningkat. Tambahan lagi, hasil daripada ujikaji ini turut dibandingkan dengan kajian yang telah diterbitkan dan didapati wujud kesamaan antara keduanya.