

Mechanical and physical properties of micro alumina reinforced direct recycled AA6061 chips based matrix by hot extrusion process

ABSTRACT

Direct hot extrusion is an alternative process for recycling aluminium without melting the scrap. It utilizes low energy and is environmental friendly. This study shows the effects of preheating temperature (PHT), preheating time (PHti) and addition of volume fraction (VF) of micro alumina on the microhardness (MH), density and microstructure of the extruded profiles. Three values of PHT (450, 500, 550 °C), PHti (1, 2, 3 hours) and VF (5, 10, 15 %) were considered respectively. The full factorial design with center point analysis was used to demonstrate the effect of process variables on responses. A total of 19 experimental runs were performed through the hot extrusion process. The results show that the preheating temperature is the most important factor to be controlled in order to obtain the optimum MH and density, while preheating time and volume fraction trailed behind the former. It can be concluded that microhardness increases with the increase in PHT and decrease in PHti and VF. On the contrary, an increase in density was observed with a decrease in PHT, PHti and VF apiece. The impact of hot extrusion parameters on the average grain sizes and microstructural analysis of the recycled samples were equally investigated and discussed.

Keyword: AA6061; Aluminum alloy; Density; Hot extrusion; Micro alumina; Microhardness; metal matrix composites; Microstructure