

Simulation of Settling, Casting Fluidity and Solidification of Aluminum SiC Particle Composites

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The influence for group of variables on aluminium A355 and A356 composites reinforced with SiC particles after the extrusion process was investigated by the finite element method. These variables are the percentage of liquid material and the ram speed, die angle and the reduction percentage in the area. The volume percentage of the SiC particles was 10%,15% and 20% percentage and the investigated made at room temperature ,150 0C and 300 0C. The results show that the ram speed increased with the increasing in the liquid fraction and decreasing in the die angle and reduction percentage, the results show also that the porosity percentage decreased and the mechanical properties improved

Introduction

Metal Matrix Composites (MMCs) exhibit a combination of properties not found in monolithic metals. The addition of high modulus fibers , particles, nodules or whiskers to conventional alloys can result in favorable changes in strength, elastic modulus, wear resistance, creep resistance, coefficient of thermal expansion and fatigue life. In addition, although second phase additions can result in a loss of tensile ductility, lower fracture toughness, and an increase in density, specific properties of the composites are usually improved enough to provide considerable weight savings potential in load bearing and high temperature applications. In particular, they offer widespread potential due to their essentially isotropic properties and substantially improved strengths and stiffness compared to unreinforced alloy [1-3]. Aluminum-silicon metal matrix particulate composites are attractive for these applications because they exhibit unusual combinations of structural, physical thermal properties, low

density, low thermal expansion, high modulus and strength, and good creep and wear resistance [4]. Semi-solid metal forming processes are of large industrial interest for the production of various components because they have advantages over casting, forging and powder metallurgy techniques, such as reduction of macro-segregation, reduction of porosity, low forming efforts and possibility of near-net shape forming etc. In the semi-solid extrusion, because the material of the semi-solid state flows out only through a die exit, the flow and deformation of material is constrained. The flow and deformation of the semi-solid alloy studied in the investigation at changing initial liquid fraction, angle of die and reduction in area [5-7]. A computer simulation or a computer model is a computer program that attempts to simulate an abstract model of a particular system. Computer simulations have become an useful part of mathematical modeling of many natural systems in physics (Computational Physics), chemistry and biology, human systems in economics, psychology, and social science and in the process of engineering new tech-