DESIGN,FABRICATION AND PRODUCTION OF GAS ATOMIZED METAL POWDER

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Abstract

In this project, gas atomizer is designed, fabricated, and trials runs are performed to produce Al alloy and Cu alloy powder. The melt is prepared in an induction furnace and enough superheat is given to ensure complete atomization. The molten metal is poured into the preheated crucible-nozzle assembly and atomized by nitrogen gas at high pressure. During atomization, the high velocity gas results in the fragmentation of stream of liquid metal into fine droplets and subsequently they are solidified during the time of flight in the collecting chamber. The atomizer used in this project consists of a convergent-divergent type nozzle. The mechanism of powder formation from a stream of molten metal flowing out of nozzle takes place via multiple stages. These are: 1) Formation of wavy surface of the liquid due to small disturbances, 2) Wave fragmentation and ligament formation, 3)Disintegration of ligament into fine droplets, 4) Further breakdown of fragments into fine particles.5) Collision and coalescence of particles, and 6) solidification of droplets during time of flight. The particle size distribution was determined by sieve analysis and results show that further improvement in efficiency of the gas atomization process is required. Scanning electron microscopic analysis was performed to characterize powder. Subsequent to powder production, green pellets are made by compacting powder mixed with 2% Poly Vinyl Alcohol in a die at a high pressure. The green pellets produced by compacts do not have the required strength. These pellets are sintered to produce dense preform with higher strength. In addition, trials are performed to produce gas atomized Cu powder. Sieve analysis shows promising results with regard to particle size and particle size distribution.

Keywords—*Atomization, convergent-divergent*

Professional Biography

Mr. Jigish Lakhani has completed his Bachelor of Technology in Metallurgical Engineering from Indus University, Gujarat, India in the year 2017 and pursuing Masters of engineering in The M S university with specialization in Industrial metallurgy, Gujarat, India. He has participated in various events like Student Start-up and Innovation Policy by Government of Gujarat, Present technical paper in International conference IC-RAMSD 2018 held at M S University, Gujarat India; Paper presentation in BTTD 2017 at CSIR-NML, Jamshedpur;



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