Materials Today: Proceedings xxx (xxxx) xxx

Contents lists available at ScienceDirect

Materials Today: Proceedings

journal homepage: www.elsevier.com/locate/matpr

Mechanical and metallurgical characterization of friction stir welded AA6061- ZrO_2-C hybrid MMCs

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ARTICLE INFO

Article history:
Received 4 June 2019
Accepted 30 June 2019
Available online xxxx

Keywords:
MMCs
Stir casting
SEM
XRD
FSW
Microstructure of welded MMCs

ABSTRACT

Present investigation, the metallurgical characterization of friction stir welded AA6061- ZrO_2-C Hybrid MMCs fabricated by stir casting method. The several prospective applications like automobile, aircraft and other engineering application the hybrid metal matrix composite (MMCs) are mostly used. It was produce the specific high strength, stiffness and wear properties. The properties of hybrid MMCs are depends on suitable Wt% of matrix material, Wt% of reinforcement materials and fabrication process of MMCs. The selection of Wt% of matrix material, primary and secondary reinforcement depends on specific or unique characterization of hybrid MMCs. After fabricated friction stir welded hybrid MMCs are investigate the metallurgical and mechanical properties. The microstructure of friction stir welded MMCs are produce maximum hardness value compare to base metal of MMCs.

Selection and peer-review under responsibility of the scientific committee of the 1st International Conference on Manufacturing, Material Science and Engineering.

1. Introduction

The aluminum based (MMCs) composite materials are widely used in all automobile, aerospace, light weight structure application such as cylinder liners, diesel engine piston, brake drum, rotors and Military applications in missile body casing etc [1,2]. The adding of more than two reinforcement particulates is called the hybrid MMCs, the hybrid MMCs are newly developed materials. The purpose of fabrication in hybrid MMCs is cost effective, specific strength (mechanical, thermal, high modulus with ductile in specific application. The important role in selection of Wt % matrix materials, Wt% primary reinforcement and Wt % secondary reinforcement materials, it was decided the material was ductile or bridle materials. The matrix material is used to hold reinforcements and transfer the load from matrix material to reinforcement's materials. The 6xxx and 7xxx series aluminum alloy matrix materials are mostly used in all structural application. The requirement of matrix material is low density, high strength, stiffness, high thermal conductivity etc. different types of primary and secondary reinforcements are used in hybrid MMCs like SiC, B4C, TiC, Si3N4, SiC, BN, B4C, TiC, Al2O3, ZrO2 and C etc [3–5]. the particular application to select the reinforcements of the hybrid MMCs. Mainly two types of fabrication techniques (liquid and solid state method) are mostly used in fabrication of hybrid MMCs. Compare to solid state fabrication process the liquid state process technique are mostly used in hybrid MMCs, particularly the stir casting process are mostly used in fabrication of MMCs. Because the stir casting methods are more flexible, simplified model, mass production method and homogeneous distribution of reinforcements particulates [6–8]. For finding the homogeneous distribution of reinforcements particulates by using different metallurgical characterization such as optical micro scope, SEM, XRD, and EDX [9]. After finding metallurgical characterization of MMCs to fabricate the FSW of MMCs. The fabricated FSW specimens are investigate the metallurgical and mechanical characterization.

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https://doi.org/10.1016/j.matpr.2019.06.760
2214-7853/
Selection and peer-review under responsibility of the scientific committee of the 1st International Conference on Manufacturing, Material Science and Engineering.