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Mechanical and wear properties evaluation of Al/Al_2O_3 composites fabricated by combined compo-casting and WARB process

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Abstract. Compo-casting method is one of the popular technique to produce metal based matrix composites. But, one of the main challenges in this process is un-uniform spreading of reinforced subdivisions (particles) inside the metallic matrix and the lack of desirable mechanical properties of the final produced composites due to the low bonding strength among the metal matrix and reinforcement particles. To remove these difficulties and to promote the mechanical properties of these kind of composites, the WARM ARB technique was utilized as supplementary technique to heighten the mechanical and microstructural evolution of the casted Al/Al_2O_3 composite strips. The microstructure evolution and mechanical properties of these composites have been considered versus different WARM ARB cycles by tensile test, average Vickers micro hardness test, wear test and scanning electron microscopy (SEM). The SEM results revealed that during the higher warm- ARB cycles, big alumina clusters are broken and make a uniform distribution of alumina particles. It was shown that cumulating the forming cycles improved the mechanical properties of composites. In general, combined compo-casting and ARB process would consent making Al/Al_2O_3 composites with high consistency, good microstructural and mechanical properties.

Keywords: aluminum matrix composite (AMC); compo-casting; fracture surface; SEM; warm accumulative roll bonding (WARM ARB); wear test

1. Introduction

Currently the use of aluminum matrix composites (AMCs) is felt in several productions such as automobile, aerospace, vessels and chemical productions. These needed properties are such as high strength, good wear resistance, good chemical resistance, light weight, high elastic modulus and low thermal expansion coefficient (Jamaati and Toroghinejad 2010). Amid the engineering methods for the production of metal matrix composites (MMCs), compo-casting is generally popular for its simplicity, cost efficiency and its capability for producing in large and industrial scales. The compo-casting process is a variation of the stir casting in which the ceramic or oxide particles are added to the molten metal or alloy and stirred (Amirkhanlou *et al.* 2011, Heydari Vini

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