Applied Mechanics and Materials Vols 110-116 (2012) pp 1374-1379 *Online: 2011-10-24*

doi:10.4028/www.scientific.net/AMM.110-116.1374

Effect of Quenching Media and Ageing Time on Al6061-Beryl Composites

H.N.Reddappa[1, a], H.B. Niranjan[2, b], K.R.Suresh[3, c], K.G. Satyanarayana[4, d]

[1]Research Scholar, Bangalore Institute of Technology, Bangalore, INDIA

[2]Vice Principal and Head, Department of Mechanical Engineering, Acharya Institute of Technology Bangalore, INDIA

[3]Prof. & Principal, Bangalore Institute of Technology, Bangalore, INDIA

[4]Head, Acharya R&DC, Acharya Institute of Technology, Bangalore, INDIA

[a]reddyhn.phd@gmail.com

[b]girija_hb@hotmail.com

[c]suresh_krreddy@yahoo.co.in

[d]kgs_satya@yahoo.co.in

Keywords: Al6061, Heat Treatment, Hardness, Tensile Strength, Wear

Abstract— Aluminum alloy based metal matrix composites are becoming very popular because of their outstanding properties such as high strength to weight ratio, excellent mechanical properties and improved wear properties. From literature survey it was observed that very limited report available on Aluminum alloy-beryl composites, particularly on the effect of beryl content, quenching media and heat treatment on the mechanical and wear properties of Aluminum-beryl composites. Accordingly, the aims of the present study are (i) preparation of Al6061-beryl particles by liquid metallurgy method (stir cast) with possible standardization of the beryl addition to liquid Aluminum alloy, (ii) Study the effect of different quenching media and the beryl content (2-12 wt. %) on the mechanical and wear properties of these composites in both as cast and heat treated conditions. Heat treatment procedure of solutionising at temperature of 5300C for 1hour and quenching in different media (air, water and ice) followed by natural and artificial ageing for different times was adopted. It was observed that the addition of beryl particles to Al6061 alloy improves its hardness, tensile strength and wear resistance with increasing beryl content while the heat treatment had significantly improved these properties compared to that of base alloy and as cast composites.

Introduction

Aluminum alloys have excellent mechanical properties coupled with good corrosion resistance. However, they possess poor wear and seizure resistance. To improve the above said properties, researchers have successfully dispersed various hard reinforcements such as Al_2O_3, SiC_p, flyash, glass and soft particles such as graphite, mica, and coconut shell char in aluminum alloys by different processing routes [1]. The resulting materials called 'metal matrix composites' (MMCs) exhibits superior mechanical properties over the conventional alloys [1-3]. Fine reinforcements and relatively large particle volume fractions are preferred in order to increase the strength and ductility in base alloy system.

Of all the processing routes, liquid metallurgy method is the most sought after owing to its several advantages such as economical with possibility for mass production as well as production of near net shaped components [1]. Of all the aluminum alloys, Al6061 is quite popular choice as a matrix material to prepare metal matrix composites owing to its better formability characteristics and option for the improvement of the strength of composites by adopting optimal heat treatment [4]. Although most of the studies on the Aluminum based composites have reported so far [5-9] the synergetic effect of heat treatment and the type of reinforcement playing a dominant role in dictating the final mechanical properties of composites, very little information is available pertaining to the heat treatment of Aluminum based composites.