

Microstructure and Tribological Properties of AlSi5Cu2/SiC Composite

Authors : Magdalena Suśniak, Joanna Karwan-Baczewska

Abstract : Microstructure and tribological properties of AlSi5Cu2 matrix composite reinforced with SiC have been studied by microscopic examination and basic tribological properties. Composite material was produced by the mechanical alloying and spark plasma sintering (SPS) technique. The mixture of AlSi5Cu2 chips with 0, 10, 15 wt. % of SiC powder were placed in 250 ml mixing jar and milled 40 hours. To prevent the extreme cold welding the 1 wt. % of stearic acid was added to the powder mixture as a process control agent. Mechanical alloying provide to obtain composites powder with uniform distribution of SiC in matrix. Composite powders were poured into a graphite and a pulsed electric current was passed through powder under vacuum to consolidate material. Processing conditions were: sintering temperature 450°C, uniaxial pressure 32MPa, time of sintering 5 minutes. After SPS process composite samples indicate higher hardness values, lower weight loss, and lower coefficient of friction as compared with the unreinforced alloy. Light microscope micrograph of the worn surfaces and wear debris revealed that in the unreinforced alloy the prominent wear mechanism was the adhesive wear. In the AlSi5Cu2/SiC composites, by increasing of SiC the wear mechanism changed from adhesive and micro-cutting to abrasive and delamination for composite with 20 SiC wt. %. In all the AlSi5Cu2/SiC composites, abrasive wear was the main wear mechanism.

Keywords : aluminum matrix composite, mechanical alloying, spark plasma sintering, AlSi5Cu2/SiC composite

Conference Title : ICMSE 2015 : International Conference on Materials Science and Engineering

Conference Location : Paris, France

Conference Dates : January 23-24, 2015