World Academy of Science, Engineering and Technology
International Journal of Materials and Metallurgical Engineering
Vol:10, No:02, 2016

Electroless Nickel Boron Deposition onto the SiC and B4C Ceramic Reinforced Materials

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Abstract : This present work is focused on studying to improve low wetting behaviour between liquid metal and ceramic particles. Ceramic particles like SiC and B4C have attracted great attention because of their usability as reinforcement for composite materials. However, poor wettability of particles is one of the major drawbacks of metal matrix composite production. Various methods have been studied to enhance the wetting properties between ceramic materials and metal substrates during ceramic reinforced metal matrix composites. Among these methods, autocatalytic nickel deposition is a unique process for the enhancement of the surface properties of ceramic particles. In fact, it is difficult to obtain continuous and uniform metallic coating on ceramic powders. In this study deposition of nickel boron layer on ceramic particles via autocatalytic plating in borohydride baths were investigated. Firstly, powders with different particle sizes were sensitized and activated respectively in order to ensure catalytic properties. Following the pre-treatment operations, particles were transferred into the coating bath containing nickel sulphate or nickel chloride as the Ni2+ source. The results show that a better bonding and uniform coating layer were obtained for Ni-B coatings with the Ni2+ source of NiCl2.6H2O as compared to NiSO4.6H2O. With the progress of the time, both particle surfaces are completely covered by a continuous and thin nickel boron layer. The surface morphology of the coatings that were analysed using scanning electron microscopy (SEM) show that SiC and B4C particles both distributed and different thickness of Ni-B nanolayers have been successfully coated onto the particles. The particles were mounted into a polimeric resin and polished in order to observe the thickness and the continuity of the coating layer. The composition of the coating layers were also evaluated by EDS analyses. The SEM morphologies and the EDS results of the coatings at different reaction times were adopted for detailed discussion of the Ni-B electroless plating mechanism.

Keywords : boron carbide, electroless coating, nickel boron deposition, silicon carbide
Conference Title : ICMET 2016 : International Conference on Materials Engineering and Technology
Conference Location : Melbourne, Australia
Conference Dates : February 04-05, 2016