

2nd World Congress and Expo on Nanotechnology and Material Science

April 04-06, 2016 at Dubai, UAE

The Production of Light Alloy Metal Matrix Composites Containing Nanoparticles

Nicholas Adkins, Dmytro Shevchenko and William Griffith

School of Metallurgy and Materials, College of Engineering and Physical Sciences, University of Birmingham, Edgbaston, Birmingham, United Kingdom

Development of high performance light alloys is key for the aerospace and automotive industries. This paper introduces a way to increase the properties of current alloys by introduction of nanomaterials into the metal matrix. Industrial scale application of metal matrix composites (MMC) is usually limited by the complexity of MMC production and the scalability of the manufacturing process. A novel method of production of master alloys has recently been developed at the University of Birmingham. This method includes fabrication of porous media from nanomaterial (preform) and further infiltration of preform with the liquid metal. Magnesium master alloys with the loading from 15vol% to 30vol% of SiC nanomaterial have been produced. The method of production of the preform using starch consolidation is described. Hot Isostatic Pressing (HIP) of a specially designed mild steel container has been used to infiltrate the preform. The high pressure available during HIP process (up to 150MPa) ensures infiltration of the magnesium alloy to full density. The preform is at the same temperature as the metal during infiltration.

The master alloy could be diluted during convention melting process to produce a nanocomposite with 2% loading. Some preliminary mechanical properties for the composite are presented.

This work was undertaken as a part of the European Community funded FP7 research project ExoMet “Physical Processing of Molten Light Alloys under the Influence of External Fields”.

Biography:

Dr. Nicholas Adkins is a Senior Research Fellow in the Advanced Materials & Processing Laboratory at the University of Birmingham, UK. Having received his PhD in Metallurgy in 1986 from the University of Surrey he has over 30 years experience in Powder Metallurgy and the application of Hot Isostatic Pressing. Nick now works at the University on several large, EU-funded, projects including “AMAZE”, the largest EU project on Additive Manufacturing, “AccMet” a large programme on combinatorial metallurgy and “Exomet” on metal matrix nano-composites. He is co-author of over 60 publications and 6 patents.