

Editorial

Light-Metal-Based Nanostructures for Energy and Biomedical Applications

Jianxin Zou,¹ Craig Buckley,² Huaiyu Shao,³ Gang Ji,⁴ and Kemin Zhang⁵

¹ National Engineering Research Center of Light Alloy Net Forming, School of Materials Science and Engineering, Shanghai Jiao Tong University, Shanghai 200240, China

² Department of Imaging and Applied Physics, Curtin University, GPO Box U 1987, Perth 6845, WA, Australia

³ International Institute for Carbon-Neutral Energy Research, Kyushu University, Japan

⁴ Unité Matériaux Et Transformations (UMET), CNRS UMR 8207, Université Lille 1, 59655 Villeneuve d'Ascq, France

⁵ School of Materials Engineering, Shanghai University of Engineering Science, Shanghai 201620, China

Correspondence should be addressed to Jianxin Zou; zoujx@sjtu.edu.cn

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Light metals, such as Li, Mg, and Ti, are now receiving increasing attention as functional materials owing to their superior functional properties for energy and biomedical applications. For example, Mg has a high hydrogen storage capacity up to 7.6 wt%, a high specific capacity as battery electrodes, and a good biocompatibility as biodegradable implants. These superior properties render the possibility of applying light-metal-based alloys/compounds in energy and biomedical industries. However, light-metal-based materials are also facing some serious disadvantages when used for energy and biomedical applications, which strongly limit their further industrial applications. In this issue, different approaches were used to create nanostructures in several light-metal-based materials in order to improve their properties.

The paper “Preparation and hydrogen storage properties of Mg-rich Mg-Ni ultrafine particles” by J. Zou et al. used an arc plasma method to prepare a Mg-rich Mg-Ni ultrafine powder. The hydrogen storage properties and the formation/decomposition of Mg₂NiH₄ in the Mg-Ni powder were carefully analyzed and discussed in detail.

The paper “Thermodynamic property study of nanostructured Mg-H, Mg-Ni-H, and Mg-Cu-H systems by high pressure DSC method” by H. Shao et al. analyzed some nanostructured Mg hydrides, such as Mg-H, Mg-Ni-H, and Mg-Cu-H using the high pressure DSC technique. A good

agreement in the thermodynamic data was obtained between DSC measurements and PCT measurements.

The paper “Effect of nano-magnesium hydride on the thermal decomposition behaviors of RDX” by M. Yao et al. has analyzed the decomposition behaviors of RDX with and without the addition of nano-Mg hydride. The change in thermodynamic data of the RDX/MgH₂ mixture was measured using DSC and ARC techniques, and mechanisms were discussed.

The paper “Applied pressure on altering the nanocrystallization behavior of Al₈₆Ni₆Y_{4.5}Co₂La_{1.5} metallic glass powder during spark plasma sintering and its effect on powder consolidation” by X. P. Li et al. prepared dense bulk materials using spark plasma sintering method from metallic powders. The microstructure of the consolidated powders was analyzed by the TEM technique and nanocrystallization behaviors with regards to the applied pressure during sintering were investigated.

The paper “Low temperature synthesis of hexagonal shaped α -Al₂O₃ using a solvothermal method” by A. Y.-Kim et al. prepared α -Al₂O₃ particles through a solvothermal method. The change in microstructure and properties associated with the variation in pH values during preparation was carefully analyzed.

The paper “Antibacterial TiO₂ coating incorporating silver nanoparticles by microarc oxidation and ion implantation” by

P. Zhang et al. used microarc oxidation and ion implantation method to prepare TiO₂ coatings containing Ag nanoparticles on Ti. The microstructure, phase components and antibacterial property of the TiO₂ coatings were investigated.

The paper “*Nanostructure formations and improvement in corrosion resistance of steels by means of pulsed electron beam surface treatment*” by K. M. Zhang et al. reviewed the formation of nanostructures in the surface layers of some steels induced by pulsed electron beam treatment. In particular, the mechanisms of nanostructure formations and improvement in corrosion resistance of steels were discussed in detail.

The paper “*Formation of surface nano- and textured austenite induced by pulsed electron beam irradiation under melting mode*” by K. M. Zhang and J. X. Zou studied the formation of nano- and textured austenite on the D2 mould steel and NiTi alloy after the pulsed electron beam treatment. The generation of nanostructured austenite with special texture state was investigated and the related mechanisms were proposed.

The paper “*Study on nanostructures induced by high-current pulsed electron beam*” by B. Gao et al. analyzed the formation of surface nanostructures in Mg-Zn-Y and Al-Si alloys induced by pulsed electron beam irradiation. TEM and EBSD techniques were used to characterize the nanostructures and related mechanisms of nanostructure formations in these light alloys.

The paper “*Surface nanocrystallization of 3Cr13 stainless steel induced by high-current pulsed electron beam irradiation*” by Z. Han et al. investigated the surface nanocrystallization of a 3Cr13 stainless steel induced by the pulsed electron beam treatment. It was observed that the formation of nanostructures was related to the carbide dissolution, rapid melting, solidification, and high thermal stresses in the surface layers during the beam treatment.

Jianxin Zou
Craig Buckley
Huaiyu Shao
Gang Ji
Kemin Zhang



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