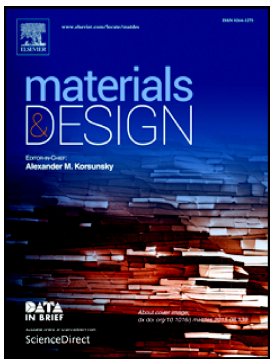

Synthesis and characterisation of floatable magnesium alloy syntactic foams with hybridised cell morphology

Akeem Damilola Akinwekomi, Chak-Yin Tang, Gary Chi-Pong Tsui, Wing-Cheung Law, Ling Chen, Xu-Sheng Yang, Mohd Hamdi

PII: S0264-1275(18)30760-3
DOI: doi:10.1016/j.matdes.2018.10.004
Reference: JMADE 7418

To appear in: *Materials & Design*

Received date: 15 June 2018
Revised date: 2 October 2018
Accepted date: 4 October 2018

Please cite this article as: Akeem Damilola Akinwekomi, Chak-Yin Tang, Gary Chi-Pong Tsui, Wing-Cheung Law, Ling Chen, Xu-Sheng Yang, Mohd Hamdi , Synthesis and characterisation of floatable magnesium alloy syntactic foams with hybridised cell morphology. Jmade (2018), doi:10.1016/j.matdes.2018.10.004

Synthesis and Characterisation of Floatable Magnesium Alloy Syntactic Foams with Hybridised Cell Morphology

Akeem Damilola Akinwekomi[1,3], Chak-Yin Tang*[1], Gary Chi-Pong Tsui[1], Wing-Cheung Law[1], Ling Chen[1], Xu-Sheng Yang[1], Mohd Hamdi[2]

[1]Department of Industrial and Systems Engineering, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong, China

[2]Centre of Advanced Manufacturing and Material Processing, Department of Mechanical Engineering, Faculty of Engineering, University of Malaya, Kuala Lumpur 50603, Malaysia

[3]Present address: Department of Metallurgical and Materials Engineering, Federal University of Technology, PMB 704, Akure, Ondo State, Nigeria.

*Corresponding author. Tel.: +852 2766 6608; Fax: +852 2362 5267. E-mail address: cy.tang@polyu.edu.hk (C.Y. Tang).

Abstract

Powder metallurgy and rapid microwave (MW) sintering techniques were successfully applied to engineer a hybrid cell structure into magnesium alloy AZ61 syntactic foams. The hybrid cell structure, comprising open- and closed-cells, originated from leached carbamide granules and hollow microspheres of fly ash (HS), respectively. External MW susceptors accelerated the sintering process and greatly mitigated the formation of undesirable interfacial reactions. The cell hybridisation technique facilitated control over the density and strength of the syntactic foams. Accordingly, floatable syntactic foams with a density of about 0.79 g/cm^3 and compressive strength of 16 MPa were synthesised without recourse to any surface modification or chemically-induced superhydrophobicity. The processing techniques were capable of mitigating damage to the HS microspheres as confirmed by microstructural examinations. Furthermore, potential applications of the floatable syntactic foam sample, as a microboat and chemical release agent, were demonstrated by using ethanol as a propellant. AZ61 syntactic foams synthesised in this study exhibited low density and adequate strength, suggesting their applicability as alternative materials to polymer composite foams.

Keywords Magnesium Alloy, Powder Metallurgy, Microwave Sintering, Mechanical Properties, Syntactic Foam, Hybrid Cells