Preliminary development of porous aluminum via powder metallurgy technique

By: Jamal, NA (Jamal, N. A.)[1]; Maizatul, O (Maizatul, O.)[1]; Anuar, H (Anuar, H.)[1]; Yusof, F (Yusof, F.)[2]; Nor, YA (Nor, Y. Ahmad)[3]; Khalid, K (Khalid, K.)[4]; Zakaria, MN (Zakaria, M. N.)[5]

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Abstract

Porous aluminum has been extensively studied, particularly in the field in which lightweight and high stiffness properties are essential. In this study, a preliminary investigation is performed to determine the optimum sintering temperature to develop porous aluminium by a powder metallurgy technique, using polymethylmethacrylate as a space holder. The effects of the sintering temperatures on the physical characteristics, oxidation level, microstructure and sintered density of the porous specimen are systematically evaluated. Based on the results, an increase in the sintering temperature from 580 degrees C to 600 degrees C changes the colour of the porous aluminum body from a silver-like colour to a gold-like colour, with some of the specimens encountering severe cracking, spalling and even collapsing. As such, the oxygen content is significantly increased from 0.45wt.% to 2.14wt. %, suggesting the oxidation phenomenon. In line with this, an obvious appearance of particle boundaries with less macro-pores formation is also observed. Additionally, the sintered density of the porous specimen is found to reduce from 1.305g/cm(3) to 0.908g/cm(3). Therefore, fabrication of the resultant porous aluminium at 580 degrees C is an ideal condition in this study, owing to the ideal combination of physical characteristics, microstructure, oxidation level and sintered density.

Keywords

Author Keywords: Porous aluminium; polymethylmethacrylate; powder metallurgy; sintering temperature; physical characteristics; microstructure; oxidation level; sintered density

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Author Information

Reprint Address: Jamal, NA (reprint author)

+ Int Islamic Univ Malaysia, Mfg & Mat Engn MME Dept, Kulliyyah Engn, POB 10, Kuala Lumpur 50728, Malaysia.

Addresses:

+ [1] Int Islamic Univ Malaysia, Mfg & Mat Engn MME Dept, Kulliyyah Engn, POB 10, Kuala Lumpur 50728, Malaysia
+ [2] Univ Malaya, Ctr Adv Mfg & Mat Proc AMMP, Fac Engn, Kuala Lumpur 50603, Malaysia
+ [3] Int Islamic Univ Malaysia, Biotechnol Engn Dept, Kulliyyah Engn, POB 10, Kuala Lumpur 50728, Malaysia
+ [4] Persiaran MARDI UPM, Biotechnol & Nanotechnol Res Ctr BT, Agrinanotechnol Programme BT04, MARDI,MARDI Headquarters, Serdang 43400, Selangor, Malaysia
+ [5] Univ Teknol MARA, Sch Ind Technol, Fac Sci Appl, Biocomposite Technol Programme, Shah Alam 40450, Selangor, Malaysia

E-mail Addresses: ayuni_jamal@iium.edu.my

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