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Preliminary development of porous aluminum via powder metallurgy technique : Vorentwicklung von porösem Aluminium durch Pulvermetallurgie (Article)

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Abstract

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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 °C to 600 °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 0.45 wt.% to 2.14 wt. %, 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 1.305 g/cm^3 to 0.908 g/cm^3. Therefore, fabrication of the resultant porous aluminium at 580 °C is an ideal condition in this study, owing to the ideal combination of physical characteristics, microstructure, oxidation level and sintered density.

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Author keywords

microstructure | oxidation level | physical characteristics | polymethylmethacrylate | Porous aluminium | powder metallurgy | sintered density | sintering temperature

Indexed keywords

Engineering controlled terms: Aluminum | Aluminum powder metallurgy | Color | Microstructure | Oxidation | Polyesters | Polymethyl methacrylates | Powder metallurgy

Engineering uncontrolled terms: High stiffness | Oxidation level | Particle boundaries | Physical characteristics | Porous aluminum | Powder metallurgy techniques | Sintered density | Sintering temperatures

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