

Title:

Use of additive manufacturing technology for fabrication of lattice structures via SLS method in “Alumide”

Author (s) Name: Paweł Klepadło- Godlewski, Maciej Kaczmarczyk,, Marta Flisykowska, Krzysztof Kanawka*

*Presenting Author

Blue Dot Solutions, Gdansk, Poland

Abstract

This abstract summarises the project named “Development of a multifunctional case for aerospace electronics, which special focus on power electronics and power supply”. This project was realised by the Blue Dot Solutions company and co-financed by the (Polish) National Research And Development Centre.

Several different types of lattice materials fabricated via the SLS method were designed and examined. Initially, these structures were simulated, a then were sintered via the SLS method. The material used for this project was “Alumide”, whic is a 7:3 mix of PA12 polyamid and aluminium. The main properties of this metallic-looking material are: high stiffness and very good characteristics for post-processing. Pieces of Alumide materials can undergo various post-treatment techniques, such as sanding, polishing or grinding.

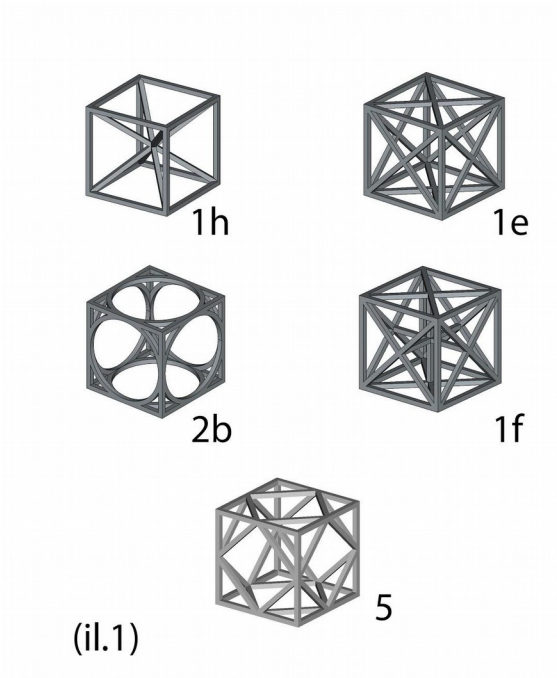
Studies and numerical simulations were done on several basic isotropic cells. Five of them were analysed further: 1e, 1f, 1h, 2b, 5 (il. 1).

The goal of the analisis was to determine the equivalent of thickness in dependence to structure of a single cell. The numerical analysis was done for thermal and thermodynamical cases (il. 2).

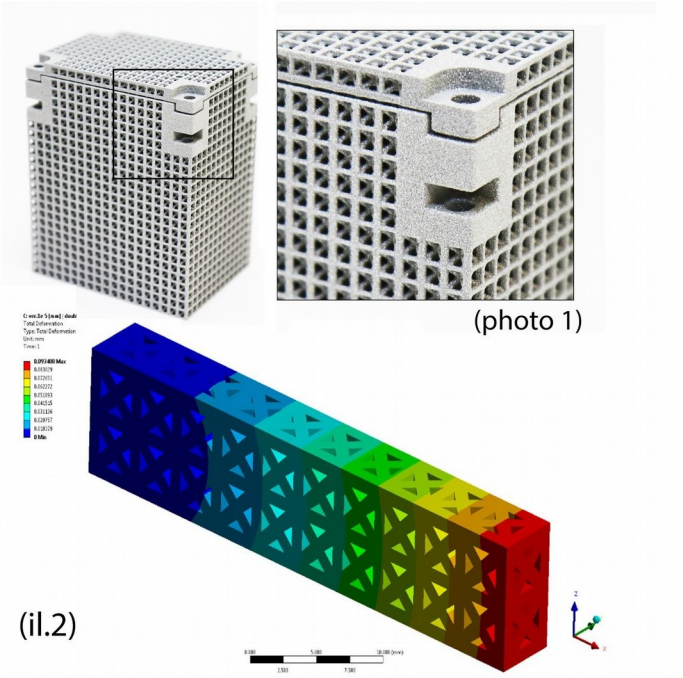
After tests on plates and beams were finished, the the prototypes of cases were fabricated (photo 1). Five different cases with different lattice structures were obtained. In addition, similar tests were conducted on cases fabricated from PLA and pure aluminum.

Finally, experiments on sintering of Alumide beams also allowed for an insight into defects, which

occured during fabrication. A comparison of results between samples with defects and these without expands the knowledge about general characteristics of Alumide material and structures after sintering.



(il.1)



(il.2)

Recent Publications (minimum 5)

K. Kanawka *et al.*, “Microstructure and performance investigation of a solid oxide fuel cells based on highly asymmetric YSZ microtubular electrolytes,” *Ind. Eng. Chem. Res.*, vol. 49, no. 13, pp. 6062–6068, 2010.

K. Kanawka, M. H. D. Othman, Z. Wu, N. Droushiotis, G. Kelsall, and K. Li, “A dual layer Ni/Ni-YSZ hollow fibre for micro-tubular SOFC anode support with a current collector,” *Electrochem. commun.*, vol. 13, no. 1, pp. 93–95, 2011.

M. H. D. Othman, N. Droushiotis, Z. Wu, K. Kanawka, G. Kelsall, and K. Li, “Electrolyte thickness control and its effect on electrolyte/anode dual-layer hollow fibres for micro-tubular solid oxide fuel cells,” *J. Memb. Sci.*, vol. 365, no. 1–2, pp. 382–388, 2010.

N. Droushiotis, U. Doraswami, K. Kanawka, G. H. Kelsall, and K. Li, “Characterization of NiO-yttria stabilised zirconia (YSZ) hollow fibres for use as SOFC anodes,” *Solid State Ionics*, vol. 180, no. 17–19, pp. 1091–1099, 2009.

K. Kanawka, M. H. D. Othman, N. Droushiotis, Z. Wu, G. Kelsall, and K. Li, “NI/NI-YSZ current collector/anode dual layer hollow fibers for micro-tubular solid oxide fuel cells,” *Fuel Cells*, vol. 11, no. 5, pp. 690–696, 2011.

N. Droushiotis *et al.*, “Comparison between anode-supported and electrolyte-supported Ni-CGO-LSCF micro-tubular solid oxide fuel cells,” *Fuel Cells*, vol. 14, no. 2, pp. 200–211, 2014.

K. Kanawka, M. Runes, and M. Moroz, “The Czech and Polish space sectors - The impact of ESA membership,” in *Proceedings of the International Astronautical Congress, IAC*, 2014, vol.

13, pp. 9499–9502.

Biography

Krzysztof Kanawka, PhD DIC, serves as CEO of a Polish space sector company Blue Dot Solutions. The company is active in fields such as practical use of satellite data, space markets (especially in Europe) and mechanical engineering. In the past Krzysztof Kanawka studied at the Department of Chemical Engineering at Imperial College London, where he did PhD in the field of (cermet) Solid Oxide Fuel Cells.

Presenting author details

Full name: Krzysztof Kanawka
Contact number: +48607160640
Email id: krzysztof.kanawka@bluedotsolutions.eu
Category: (Oral presentation)
Session name: Advances in 3D Printing & Additive Manufacturing Technology
Research interest: cermets, metals, metallic alloys, ceramics, additive manufacturing, biomimetics, space sector