ALUMINIUM – STAINLESS STEEL HYBRID COMPOSITES OBTAINED BY SELECTIVE LASER MELTING AND CENTRIFUGAL CASTING

Yaroslav Holovenko[1], Lauri Kollo[1] Märt Kolnes[1]

[1]*Department of Mechanical and Industrial Engineering, Tallinn University of Technology, Ehitajate tee 5, 19086 Tallinn, Estonia*
e-mail of presenting author: yaholo@ttu.ee

Cellular lattice structures produced by Selective Laser Melting (SLM) have attracted a lot of attention due to their high strength to mass ratio, energy absorption, thermal and acoustic isolation characteristics [1]. Materials with periodical lattice topology have number of advantages over traditional foam type materials as these can be designed directly into solid body [2]. The lattice structures can be infiltrated with secondary metals. This has a certain effect on physical properties of bulk materials, therefore pose a great potential for tailoring properties in different areas of the printed object.

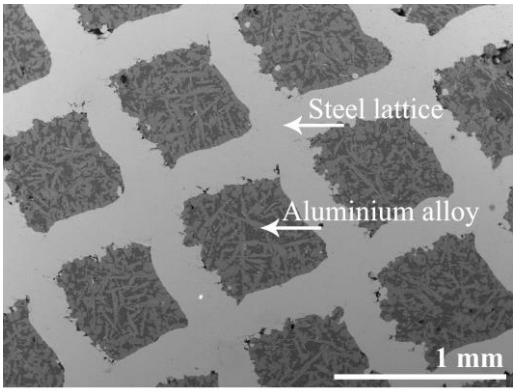

Fig.1 SEM image of stainless steel 316L lattice infiltrated with AlSi7Mg.

In the present study lattice structures with unit cell size of 1,2 mm and total sample dimensions of 14 mm × 14 mm × 21 mm were produced of stainless steel 316L via selective laser melting. AlSi7Mg alloy was used to infiltrate the lattice by centrifugal casting technique. The microstructure of composites was analyzed using Scanning Electron Microscopy (Fig. 1) and their compressive yield strength was measured using Instron 8516 servo-hydraulic testing system.

Pores of different sizes were found in AlSi7Mg mainly near lattice-alloy interface boundary. Average compressive yield strength of composite was 80,9 MPa which represents the possibility of modification of physical properties (thermal conductivity and specific density) of stainless steel parts, with minor loss of strength.

References

1. Yang, Li. "Experimental assisted design development for a 3D reticulate octahedral cellular structure using additive manufacturing." Review.
2. Jane Chu, Sarah Engelbrecht, Greg Graf, David W. Rosen, Rapid Prototyping Journal 16.4 (2010): 275-283.

Euroopa Liit
Euroopa
Regionaalarengu Fond

Eesti
tuleviku heaks