

3rd International Conference on

3D Printing Technology and Innovations

March 25-26, 2019 | Rome, Italy

Selective laser melting of aluminum matrix composites with ceramic fillers

Arnautov A, Zmanovsky S, Tarasov V P, Nalivaiko A and Gromov A
NUST "MISIS", Russia
RUSAL Co., Russia

3D printed aluminum details are lightweight (density 2700 kg/m³) and moldable, having an elasticity modulus of ~70 MPa. These are the main requirements of the 3D printing industry. However, aluminum is not strong or hard enough: the tensile strength even for the duralumin alloy is ~500 MPa, and its hardness HB sits at 20 kgf/mm³. The developed modifying precursors for aluminum matrix composites (AMC), based on aluminum nitrides and oxides obtained through combustion or hydrothermal/dry Al oxidation, have become the basis of the new composite. We develop a technology to strengthen the AMC obtained by 3D printing, and we have obtained innovative precursor-modifiers. Combustion or oxidation products - aluminum nitrides and oxides - are specifically prepared for sintering branched surfaces with transition nanolayers formed between the particles. It is the special properties and structure of the surface that allows the particles to be firmly attached to the aluminum matrix and, as a result, increase the strength of the obtained composites.



Figure 1: 3D AMC with Al₂O₃ particles.

Recent Publication:

1. G N Ambaryan, M S Vlaskin, O A Buryakovskaya, S A Kislenko, A Z Zhuk, E I Shkolnikov, A N Arnautov, S V Zmanovsky, A A Osipenkova, V P Tarasov and A A Gromov (2018) Advanced manufacturing process of ultrahigh-purity α -Al₂O₃. *Sustainable Materials and Technologies* 17:e00065.
2. A A Gromov, A Yu Nalivaiko, V P Tarasov, S V Zmanovsky, A N Arnautov, A V Sergienko and K B Larionov (2019) Chapter 5 - Aluminum powders for energetics: properties and oxidation behavior, Editor(s): Qi-Long Yan, Guo-Qiang He, Pei-Jin Liu, Michael Gozin, In *Micro and Nano Technologies, Nanomaterials in Rocket Propulsion Systems*, Elsevier 151-173.
3. Arnautov Alexey, Zmanovsky Sergey, Nalivaiko Anton, Vlaskin Mikhail and Gromov Alexander (2018) 3D printing of «Aluminum - 10 -20 wt. % Alumina» composites with core-shell particles as raw materials. *Book of abstracts MAMC 2018, Austria, Vienna, 2018.*
4. Arnautov Alexey, Zmanovsky Sergey, Osipenkova Alexandra, Tarasov Vadim, Vlaskin Mikhail and Gromov Alexander (2018) Study of 3D printing of in situ synthesized core-shell aluminum-alumina composites, *Book of abstracts European Advanced Materials Congress - 2018, Stockholm, Sweden, 2018*

Biography

Arnautov A is now at the completion of his PhD from the research group of Prof. Dr.-Ing. Alexander Gromov, NUST "MISIS" University, Moscow. He is the Head of the Department at RUSAL Co., a premier research organization. He has published more than 10 papers in reputed journals and conference proceeding on additive manufacturing.

alexandergromov1@gmail.com