Ni/Al and Ti/Al rounded reactive composites for Selective Laser Melting

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Modern technology and industry set the main task for materials science - design and creation of new-generation materials with a set of enhanced properties. Often only composite materials can satisfy such requirements. In parallel with this, methods for producing items with complex or non-standard geometry by using various additive technologies are being developed. The use of composite materials in 3D printing will make it possible to obtain products with improved properties in a shorter time and with lower manufacturing costs. Since the choice of refractory powders for additive technologies, namely, metallic or ceramic, is still very limited, it is necessary to develop new approaches to obtain such powders. The idea of our approach is to use a mixture of relatively low-melting components as a starting material, which will react during the process of selective sintering or melting, forming a more refractory compound. In case of the exothermic reaction chemical heat release will be added to the amount of heat gained from the laser heating. This makes possible to expand the capabilities of selective laser melting and obtain more refractory and heat-resistant materials and products.

In this work, composite powders of various morphologies, primarily with rounded particles and flowability, suitable for use in 3D printing, were obtained in Ni-Al and Ti-Al systems by processing in a planetary ball mill. On the obtained powders were carried out experiments for thin plates producing by 3D printing on an SLM 280 HL setup from SLM solutions.

Biography

Andrey Nepapushev is a research associate of the scientific research center “Functional Nanoceramics” at NUST “MISiS” since 2011. Field of scientific interests includes mechanical activation for producing reactive composite materials, kinetics of the high temperature reactions, joining of refractory and dissimilar materials. Nb of publications: 31 (Scopus) - 221 time cited; Hindex=8.