Development of new generation aluminum alloys for additive technologies

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Radio-frequency plasma spheroidization of zirconium oxide powder

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Zirconia-based ceramic powder compositions stabilized with oxides of rare earth metals are widely used as heat-resistant coatings for gas turbine engines. Production of high-quality heat-resistant coatings requires high degree of sphericity of powder particles that ensures good adhesion and a high utilization rate of powder material. The objective of current research is optimization of equipment and technologies of plasma-based spheroidization of initial ZrO_2 powder that consists of particles of arbitrary shape.

A crushed ZrO_2 powder with particles of arbitrary geometric shape was used as the initial raw material. A laboratory plasma chemical reactor with a discharge power of 40 kW and a frequency of 5.2 MHz was used for spheroidization of the powder. The plasma-forming gas is argon.

Optimization of the operating mode of the plasma-chemical reactor has been carried out to achieve the maximum efficiency of the spheroidization process. A comparative study of heat-insulating coatings obtained based on the spheroidized powder and commercial powder Sulser Metco 240C was carried out. The results of the study have shown that the coating obtained using the spheroidized zirconia powder is not worse compared to the ones based on commercial powder in terms of the main parameters.

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