SELECTIVE LASER AGGLOMERATION. FEATURES OF APPLICATION

Zybina Alena Vladimirovna; Savin Igor Alekseevich
Kazan National Research Technical University named after A.N.Tupolev,
Naberezhnye Chelny savin.ia@kaichelny.ru

Abstract: For two decades the alternative method of creation of 3D objects which received the name "technology of fast prototyping" promptly develops. In comparison from traditional methods of shaping where from preparation all separates superfluous and thanks to it the detail turns out, at technology fast prototyping the detail is grown up by layer-by-layer addition of material. B to article are considered features of a method of prototyping by laser agglomeration and the field of its application.

Keywords: prototyping, laser agglomeration, selective agglomeration

Agglomeration of fine parts of an expendable material under influence of So2 of the laser is the cornerstone of a method of laser agglomeration. The expendable material is previously warmed up to the temperature close to material melting temperature (or binding elements). For this technique powders fine, thermoplastic, with good viscosity and quickly hardening - for example, various polymers, metals and alloys (various became, titanium, aluminum, precious metals, nickel heat resisting alloys, cobalt - chrome alloys, etc.) and also composites and sandy mixes are necessary. As a result of use of technology it is possible to receive functional prototypes of plastic details, sandy forms and cores for metallurgy, models for casting on the melted models and also metal details or fragments of form-building elements of compression molds. [1]

In SLS technology multicomponent powders or powder mixes from different chemical materials are applied, unlike DMLS technology (direct metal laser agglomeration) where unicomponent powders are generally used.

Selective laser agglomeration (SLS) consists in layer-by-layer agglomeration of particles of powdery material before formation of a physical object on the set CAD model. Agglomeration of material happens under the influence of a beam of one or several lasers. Before construction process the expendable material is warmed almost up to the melting temperature that facilitates and accelerates SLS installation work. [1]

Process of construction on SLS technology is additive.

Advantages of Selective Laser Sintering (SLS) technology:

- the received sample has properties of monolithic material (for example: elasticity of plastic) that substantially increases scope of application;

- available and nontoxical materials;

- big range of a kind of powders is applied;

- there is no need for additional stability of a sample;

- small extent of deformation of models and tension;

- a possibility of production at once several models in one camera;

Shortcomings of Selective Laser Sintering (SLS) technology:

- high roughness of the received models;

- porosity of samples;

- need of formation of the first layer from similar material for reduction of thermal influences;

- admissibility change of density of a sample;

- need of cleaning of the camera when replacing swore.

From metal powders grow up samples of compression molds, specialized tools, special quality of a detail of the complicated configuration which hardly or cannot be received casting or mechanoprocessing. Already now by single and small-scale production very becomes economic "to grow up" party of a small amount of details by SLS car, than to make the foundry or shtampovy equipment. [2]

References:

1. Savin I.A. Determination of the effectiveness of the use of robotic systems in mechanical engineering//European Journal of Natural History. 2016. № 3. P. 94-97.

2. Gavariev, R.V., Savin, I.A., Leushin, I.O. Impact of the functional coating on service durability of injection molds for the zinc alloys pressure casting. (2016) Tsvetnye Metally No. 1. pp. 66-70 DOI: 10.17580/tsm.2016.01.11