Science and Technology City Hall
KRASNOYARSK, RUSSIA

«CONFERENCE NAME»

«Monitoring the influence of heat treatment modes on the structure and properties of products from titanium powders obtained by different production methods»

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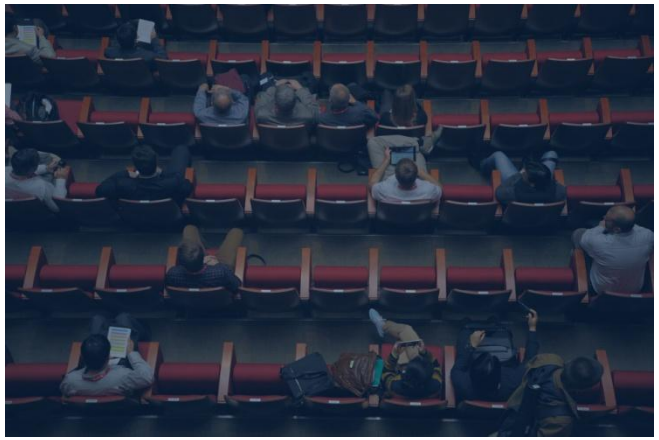
Problem statement

- At present, powder technology is a developing industry, including the production of metals and alloys in the form of powders with particles of different dispersion, granules, filamentary and other forms, the production of various parts of machines and devices, tools and special purpose products based on metal powders using methods powder technology, development and creation of composite materials on metallic and non-metallic bases and the manufacture of products with special properties from them, strengthening and restoration of machine parts and devices by powder spraying and surfacing methods, imparting increased mechanical or special physical and chemical properties to the surface of products

Solution methods

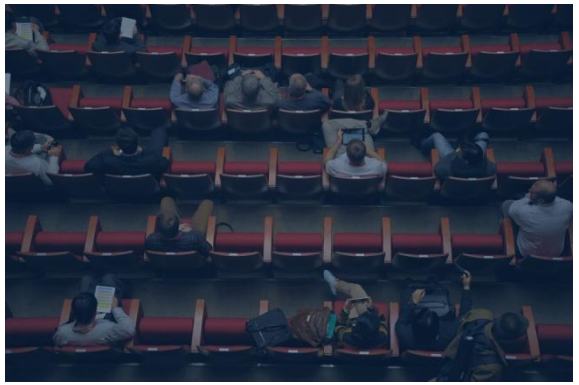
- We used titanium powders obtained by different production methods, namely: electrolytic refined powders of high purity, electrolytic industrial, sodium thermal, magnesium thermal powders.
- Structural products made of titanium powders intended for mechanical engineering were obtained as follows: the mold was filled with powder, and semi-finished products were prepared by isostatic or mechanical pressing on a PG-250 press at a constant pressure P = 8 MPa without additional use of lubricant. It was found that the bulk density of powders depended on the method of their production and the degree of contamination with impurities, which increased with a decrease in the degree of contamination in the direction from magnesium-thermal to refined. They had the smallest bulk density due to the high branching of particles and the degree of contamination of magnesium-thermal powders.



Results

Table 1. Characteristics of the properties of sintered products from titanium powders of different production methods

Powder production method	Particle size, mm	Powder hardness, HB, MPa	Chemical composition of the powder,%			Density of samples, ρ / ρ, kg / m³	Mechanical properties of parts			
			∑ gas ave.	∑ met.pr	∑ all		σт, MPa	HB, MPa	δ,%	ψ%
Electrolytic refined titanium	-0.32+0.20	850	0.100	0.039	0.139	4336/4105	307	837	56.4	46.7
Electrolytic industry	-0.63+0.20	1310	0.162	0.125	0.287	4284/4150	397	1230	8.9	23.7
50% raffin. + 50% magnetotherm.	-0.40+0.18	1340	0.379	0.135	0.514	4256/4019	367	1320	14.8	21.5
Magniethermic	-0.40+-0.18	2200	0.762	0.427	1.189	4180/3920	447	2035	3.1	6.2
Natrithermic.	-0.60+0.18	1390	0.329	0.229	0.557	4256/4154	380	1205	14.2	26.0



Conclusions

Based on the studies carried out on pressing, sintering, mechanical tests and the study of the microstructure of samples made from titanium powders of different production, the following conclusions can be drawn:

- titanium powders of different production methods can be used for the manufacture of structural products for a specific purpose;

-the best mechanical properties are obtained for parts sintered from electrolytic and sodium-thermal titanium powders;

- sintered products from sodium thermal powders had a higher plasticity in comparison with parts from electrolytic powders;

- the chemical composition of the powder has a significant effect on the mechanical properties of sintered products;

- the morphology of the structure and mechanical properties, the degree of porosity of sintered articles made of titanium powders were significantly influenced by the modes of heat treatment in vacuum.

- When writing the work, more than 70 sources of literature were used, 34 of which are reflected in the bibliographic list.
- The results obtained can be used to create resource-saving technologies for powder metallurgy with dispersed materials, in particular, to increase the productivity and quality of the molding and sintering processes of titanium powders.
- Scientific results obtained by other specialists presented in the bibliographic list do not contradict our research.
- The tests were carried out on the equipment of the Shared Use Center "Materials Research Center".

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