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ABOUT IMPROVEMENT OF TECHNOLOGY FOR MAGNESIUMTHERMAL PRODUCTION OF TITANIUM

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Consideration has been given to the tendencies of the of titanium production development by the method of magnesium renewal over the past decade. The main positive and negative aspects analyzed associated with the growth of cycle productivity of recovery and vacuum separation apparatus. The possibility of intensification and the main tasks in the way of hardware design method of continuous titanium production based on the analysis of kinetics of the main steps of the implementation process it was shown.

Keywords: titanium, tetrachloride of titanium, magnesium, renewal, vacuum separation, apparatus of renewal and separation

Technology of magnesium-thermal production of titanium in the last few years did not change fundamentally. A basic improvement was sent to apparatus registration of process, increase of the cycle productivity of apparatuses, which also allows some to improve the technical and economic facts of production for spongy titanium and quality of the got metal on content the row of admixtures. In passing there are decided also the questions of quality for recurrent chloride of magnesium, acting on an electrolysis.

On GRE «Zaporozhe titanium-magnesium combine» there are inculcated apparatuses by the cycle productivity of 4.2 t titanium with the lateral location of condenser for apparatus of vacuum separation. Thus attained middle speed of serve for tetrachloride of titanium is in the apparatus of renewal 300-420 kg/hour, and also specific productivity on titanium at renewal 55-60 kg/hour, and during vacuum separation 45-50 kg/hour [1]. On OAJ «Solikamsk magnesium plant» (Russian Federation) as a result of introduction of apparatuses of the cycle productivity on titanium of 7.0 t with the upper location of condenser during separation, it is attained high speed of serve of tetrachloride of titanium 60 kg/hour, hourly productivity on titanium on renewal is 71.3 kg/hour and it is 69.2-61.5 kg/hour on vacuum separateon [2].

The increase of the cycle productivity of apparatuses does not remove substantial defects technologies, conditioned by periodicity of process:

– it is a partial application of magnesium in the cycle of renewal, conditioned by the thermal-physic features of the got reactionary mass and subsequent process of it vacuum separation;

– there are high power expenses on cutting of the got block of titanic sponge, its crushing and classification;

– it is heterogeneity of quality for the got sponge, that demands additional charges and development of methods of it sorting;

– it is a necessity of warming-up and cooling of reactors at the beginning and at completion of technological cycle, that stipulates additional power expenses.

On this basis, intensification of technology can be attained by the exception of the low out-put stages, when speed of processes, because of diffusive difficulties, substantially falls down on, and by a care from forming of block of spongy titanium. It will allow not only to increase speed of process and it specific productivity in 2-3 time (in accordance with kinetic parameters) but also substantially to shorten duration of the technological stages, and, consequently, and to optimize an energy consumption which increases in periods of attenuation flow of process. Receipt of titanium not as a massive block, and as more shallow structures positively tells and on the cutback of the productive spending at extraction of block from a retort and it processing.

Obviously, that such modernization of technology and receipt on the stage of renewal of the prepared product not as a reactionary block, and as dendritic structures of the fixed size, create a certain perspective for more rapid successive transition in realization of the technological stages and apparatus registration of continuous or semicontinuous method of renewal.

Basic ideas and possible technical decisions for realization of continuous method, offered before by foreign developers, considered in work [3]. Granular magnesium of faction a 0.5-1.6 mm gave on the surface of fusion portions for 21-22 kg. The expense of tetrachloride of titanium arrived at 150-160 kg/hour and limited by possibilities of taking of warmth from a reactor, placed in the standard furnace of renewal. The got block of reactionary mass is clean salt which in an lower part contains a metal as granular and powdery titanium.

On results researches the temperature of fusion (630 ºС) was accepted as a border, which provided melting of granules of magnesium due to the warmth of exothermic reaction of renewal, and realization of process in the optimal mode. Maximal output of titanium as granules (80-90 %) will attain at a temperature a process 650-700 ºС [5].

Works [6-8] were fundamentally other direction of creation for continuous technology. By the authors of work [8] the theoretical estimation of speed of cooperation for vaporous molecules of tetrachloride of titanium is executed with the clean surface of molten magnesium, and performed conclusion about possibility of education of embryos of titanium in an initial period of process in different phases and without participation of walls of reactor as padding. The further increase of granules of titanium was carried out on the surface of particles of titanium, circulatory together with fusion. The large particles of titanium under influence of gravity forces went down in an lower part, consistently passing through the layer of fusion of magnesium and chloride of magnesium, that provides additional reduction of more subzero chlorides on the surface of granules.

Conclusions. Basic renditions progresses of magnesium-thermal method for production of titanium trends are considered. It is set that, in spite of the attained

increase cyclic productivity apparatuses of renewal and vacuum separation, the specific productivity of process falls down. The kinetic features of the separate stages of magnesium-thermal process are analyzed. With the purpose of increase of specific speed of process in 2-3 times it is suggested to exclude from technology the slow stages, conditioned by the diffusive braking of transport of reagents in the area of reaction.

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