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**DEVELOPMENT OF TECHNICAL DECISIONS TO REDUCE THE CONTENT
OF TITANIUM DIBORIDS IN ALUMINUM ALLOYS 6XXX SERIES**

AUTHOR'S ABSTRACT

of the thesis for

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The abstract of the Master's Thesis is available on the website of the Siberian Federal University <http://edu.sfu-kras.ru/engineering> and in the open access archive: <http://elib.sfu-kras.ru>

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INTRODUCTION

Timeliness of work. Every year, the consumption of aluminum and alloys based on it is growing in the world. In turn, with increasing demand, the requirements to the quality of products from consumers are tightened. One of the ways to improve the quality of cylindrical ingots is to reduce the content of agglomerates (clusters) of titanium diborides in the structure of cylindrical ingots, which ultimately influence the extrusion properties during processing of products from the consumer and, as a result, increase the amount of technological waste generation. To improve the quality of cylindrical ingots and meet the requirements of consumers, it is necessary to develop technical solutions that will minimize the amount of agglomerates (clusters) of titanium diborides in cylindrical ingots without reducing the volume of production of marketable products.

The subject of the study - technology of production of cylindrical ingots from aluminum alloys 6xxx series.

Work objective - materials and equipment used in the production process of cylindrical ingots.

Objective: to develop technical solutions that allow to minimize the amount of agglomerates (clusters) of titanium diborides in cylindrical ingots.

To achieve the goals the following tasks are solved:

- Perform a theoretical review of the problem being solved.
- To carry out an analysis of the existing conditions for the supply of cylindrical ingots, the requirements for the microstructure of cylindrical ingots in the current specifications of «RUSAL Sayanogorsk», the assessment of the possibility of their implementation in the conditions of the current technology.
- Analyze the technology of melt preparation and remelting of waste, selection of samples for evaluation of melt quality, their evaluation. Analysis of the technology of modification. Analysis of filtration technology.
- Carry out pilot batches of cylindrical ingots using the optimal technology for modifying and filtering the melt.
- Produce pilot batches of cylindrical ingots according to the corrected technology of cleaning mixers, pouring of raw aluminum and preparation of melt.
- Issue pilot batches of cylindrical ingots in order to confirm the achieved results.
- Develop technological parameters and a package of technological documents.
- Increase the supply of cylindrical ingots for consumers.
- Analyze the results.

Scientific novelty of the work

The developed technical solutions allow to minimize the amount of agglomerates (clusters) of titanium diborides in cylindrical ingots.

Practical significance of the work

1. According to the results of the work done, the change in the technology of production of cylindrical ingots allows controlling the amount of agglomerates (clusters) of titanium diborides in semi-finished products.

2. The developed technical solutions do not reduce the production capacity for the production of cylindrical ingots.

3. Application of the developed technical solutions allowed to increase the supply to «SAPA» (Sweden), as well as to expand the circle of consumers of cylindrical ingots of JSC «RUSAL Sayanogorsk» in the world market.

Personal contribution of the author

All results of the research were obtained with the personal participation of the author.

Place of accomplishment of the thesis - Department of Casting Process of the Institute of Non-ferrous metals and Material Science of the Federal State Autonomous Educational Institution of Higher Education (FSAEI of HE), Siberian Federal University.

Place of international internship - MECAS ESI Group, the Czech Republic.

Approbation of the thesis The main provisions of the thesis are not presented in the media in conformity with the confidential policy of UC RUSAL.

Publications. N/A.

The volume and structure of the dissertation. The thesis consists of an introduction, six chapters and a conclusion. Contains 65 pages of typewritten text, 20 figures, 14 tables, a bibliographic list of 12 items.

CONTENT OF THE THESIS

In the introduction, the relevance of the topic is substantiated and the goal, the tasks of the work, is formulated, its novelty and practical significance are noted.

In the first chapter, the requirement is considered for the typical chemical composition of cylindrical ingots, the effect of the chemical composition on the strength properties of the profile, and also the requirement for hydrogen content. The analysis of statistics is carried out, the key requirements of consumers to the macro- and microstructure are determined.

The technological chain - equipment and materials for the production of cylindrical ingots is analyzed. According to the analysis of scientific and technical literature, the following conclusions can be drawn:

1. Cylindrical ingots of alloys 6xxx series are widely used in many industries: construction, parts for the automotive industry, a profile of different sizes, etc.

2. The existing technology for the production of cylindrical ingots requires a change in the technological chain to meet customer requirements in terms of limiting the amount of agglomerates (clusters) of titanium diborides in finished products.

Based on the conclusions drawn, the tasks of the dissertation work are formulated.

In the second chapter, work was carried out to analyze the existing technology, pilot batches of cylindrical ingots were produced. The samples are analyzed in the scientific and analytical laboratory of the Foundry Center of OOO «RUSAL ITC». The selection of the optimal technological parameters for the production of cylindrical ingots ensuring a minimization of the amount of agglomerates (clusters) of titanium diborides in the finished product has been selected. A package of normative and technological documents was developed.

The **conclusion** presents the main findings and results of the research.

MAIN FINDINGS AND CONCLUSIONS

- The analysis of the existing conditions for the supply of cylindrical ingots, the requirements for the microstructure of cylindrical ingots in the current specifications of JSC RUSAL Sayanogorsk, and the feasibility of their implementation in the conditions of the current technology.
- The analysis of the technology of melt preparation and remelting of waste was performed, the samples for the estimation of melt quality, their evaluation were selected. The analysis of technology of modification and technology of filtration is carried out.
- Experimental batches of cylindrical ingots were made using the optimal technology of melt modification and filtration.
- Experimental batches of cylindrical ingots were made according to the corrected technology of cleaning mixers, pouring of aluminum raw material and melt preparation.
- Experimental batches of cylindrical ingots have been issued in order to confirm the achieved results.
- Technological parameters and a package of normative-technological documents have been developed.
- The volume of supplies for consumers of the Asian market has been increased.

CONCLUSION

The goal and objectives of the master's dissertational work are fulfilled in full. The results of investigations of the cylindrical ingot templates confirm the decrease in the content of agglomerates (clusters) of titanium diborides in the structure of cylindrical ingots without changing the grain size. Publications on the work performed were not released due to the confidential policy of UC RUSAL.