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CHOOSING THE OPTIMAL MODIFIER TO INCREASE THE ABSORBENCY OF THE DETAILS CAST FROM GADFIELD STEEL

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Abstract
In this article, a crushing cone suitable for world templates, high quality to machinery manufacturing enterprises, resistant to mowing, high strength and such a variety of details, as well as the production of heavy industrial products, set the task of specialists and scientists in this field as important as improving the existing technology and technology. In turn, the increasing level of equipment improvement at machine-building production enterprises also requires a lot of attention to the quality of metals. It is indicated that steel enterprises, as a rule, do not have special equipment for processing steel. In such conditions, the only and very effective way to improve the quality of steel in practice is the processing of liquid metal with special complex modifier alloys in the steel casting department. Modification of metals and alloys (its variety) is a deep process of their existence, actively influencing the state of metal solutions in the crystallization period, by introducing small additives of substances (modifiers) that lead to a change in the morphology of mirrors additives.

Keywords: Modifier, alloy, crystallization, hardness, smelting, steel, detail, hardness, temperature.

Introduction
At enterprises of the Republic of Uzbekistan are conducting measures to obtain quality cast products in the period of liquefaction of steel by means of an electric arc and induction furnaces. In addition, extensive research is underway to improve the efficiency of liquefaction, and research is underway to improve the technology to do so. Also, it is important to increase the priority research and development of resource and energy-saving technologies in liquefied steels widely used in industry.
The machine-building industry consists of a number of technological processes at manufacturing enterprises, forming a kind of technological chain. This chain is closely related to the performance of each unit and the working quality of the machines that preceded it. In view of the foregoing, it can be concluded that the influence of technological chain equipment on the quality indicators of machine-building enterprises and products of heavy industry is great. Therefore, the most efficient operation of machine-building enterprises and technological equipment of heavy industry without damage in many respects depends on the durability of parts. It basically involves learning the

process of working parts rubbing with each other.

By scientists from many countries of the world, high manganese steel A comprehensive study has been carried out and results have been carried out on the possibility of heating and cooling of alloy, changing the internal structure, chemical, physical and mechanical properties, changing the structure of brand 110G13L by heating and cooling, increasing the durability of heat treatment.

The fact that metals have the ability to dissolve various elements allows the diffusion of atoms of the substance surrounding this metal at high temperatures into the metal, as a result of which the chemical composition of the metal surface layer changes. Their diffusion of atoms onto a metal is a chemical process, but temperature plays a major role in the progress of this process so the diffusion process cannot be referred to as a purely chemical treatment. Such processing, which changes the chemical composition of the surface layer of the alloy, is called chemical-thermal treatment. Types of chemical-thermal processing are described in detail by studying the literature of domestic and foreign scientists. In subsequent years, the method of working alloys under pressure at the same time as changing their structure is increasingly used. This processing of alloys is called thermomechanical processing. When an alloy is deformed, not only does its appearance change, but also a graft is formed in it, which thermally treats the transferred alloy. Consequently, it is necessary to add thermomechanical treatment to the process of studying the literature specific to our various scientific research works of thermal treatment.

MATERIALS AND METHODS

Scientists from the CIS countries have conducted important research on resource saving in liquefaction of iron and its alloys (Yu.P. Kupryakov, V.S. Chaxotin, Yu.I. Prixodko ecs.).

Modern mechanical engineering is the main consumer of metals produced in our country. In the machine-tool industry, automotive and aviation industry, electronics and radio engineering, a huge number of machine and hardware parts are made from metals.

Obtaining high durability and edible products is one of the main challenges facing ferrous metallurgy today. Therefore, research into the creation of new alloys, alloy processing and the development of new progressive methods of alloys are of great importance. One of the ways to increase the efficiency of ingot production and the competitiveness of the resulting ingot is to increase their quality while reducing costs. This requires the development and enhancement of new technologies that allow achieving more stable results ensuring the production of ingot with certain properties. However, the use of these methods does not allow to ensure the required quality of castings in terms of size and geometric accuracy, surface purity and structural uniformity.

Having developed the composition of several modifiers and to improve the strength of the incast steel alloy parts, foreign scientists conducted a lot of researches. In particular, Pyotr Alexandrovich Rebinder, a physicist and chemist from Moscow, St. Petersburg, academician of the Academy of Sciences, determined that according to the classification, it is divided into two groups. These are as follows;

the first type serves to increase the number of modifiers - crystal centers;

The second type of modifier - one determines and changes the direction of the crystal buds.

In 1882, this steel (110G13L) was named Gadfield steel by the English metallurgist Robert Gadfield because of its high strength compared to other steels (St – 30, St – 40, St – 45). Gadfield steel (110G13L) is characterized by high compressive and shock forces (11 – 14.5 % Mn, 0.9 – 1.3 % S, GOST 977 – 88), as well as high plasticity.

Robert Gadfield's proposed 110G13L branded modified steel tank tracks were used to make ploughing plugs for tractors, railway rails, various parts that work under strong shock and friction, as well as window bars that cannot be sawed in prisons.

The ability of austenitic Fe–Mn alloys to harden as a result of deformation was also discovered by R.E. Gadfield in 1884. He refined the manganese content in steel to 11–12% and found that steel has abrasive abrasive effects of high viscosity and resistance after cooling in water at temperatures of 1000°C. Gadfield patented a new steel, and it has since been known by its own name (Gadfield Steel) and in the CIS countries – as High Manganese Steel 110G13L. Since then, a lot of work has been done to study brand steel 110G13L, to improve its properties and to create new varieties of edible resistant steels for its replacement. Until now, however, Gadfield steel has been the main material for the production of castings that operate under a military-abrasive abrasive coating. From it produces about 0.6 million tons of ingots per year.

But despite all the research, scientific research and experimental work conducted by world scientists, there are several deficiencies in the edibility of brand steel 110G13L.

In metallurgical plants in the Republic of Uzbekistan, in particular, at Almalyk Iron and Steel Mills enterprises are widely used cones for crushing units. Due to the rapid depletion of used grinding cones and many similar parts, their service life is not up to demand. The average service life of a single grinding cone is 3 months. Therefore, in the process of their preparation, a number of measures are being implemented to improve the strength of edible surfaces, and new technologies are being introduced. One of them technologies is the selection and addition of optimal modifiers to enhance the mechanical properties of cast-iron products obtained during melting process as well as to increase their dispersion, strength strength and hardness as a result of thermal treatment.

In the foundry shop of SRM plant of JSC "Almalyk KMK" steel 110G13L brand is melted in electric arc furnaces DS-5MT, DSP-3.

The melting weight of the furnace DS-5MT is 5 tn. transformer power is 5000 kVa, diameter of graphite electrodes is 300 mm, furnace capacity (theoretically) is 10,000 tons per year, specific electricity consumption is 716.5 kW. h/t.

The melting weight of the DSP-3 furnace is 3 tn. transformer power is 2370 kVa, diameter of graphite electrodes is 300 mm, furnace capacity (theoretical) is 4700 t per year, specific electricity consumption is 716.5 kWh/t.

The process of steel liquefaction in substrate furnaces includes filling, juice selection, liquefaction, oxidation, recovery, and demolescence cycles. Steel plates and waste are thrown into the furnace, no more than 10% processed chushka sheets, coke or electrode fragments. Electrode fractures are thrown into the furnace in such a way that the amount of carbon in the furnace is 0.3% higher than its lower limit in steel of a specified grade, 0.3% in multi-carbon steels, 0.4% in medium-carbon steels, and 0.5-0.6% in low-carbon steels. The following procedure for selecting the strip is adopted: half of a small steel scrap is thrown to the bottom of the furnace, on top of which a large strip is placed under the electrodes in the center of the furnace, on a large iron trough of medium size close to the slopes, on which the other half of the small scrap is placed. Steel is laid on top of it, huge pieces of coke are thrown under the electrodes so that it is easy to ignite the electrodes and the electrodes are burned. Such a procedure of casting ink protects the bottom of the furnace from the shocks of the furnace pieces, the electrical conductivity of the furnace is great when the ink is pressed, consequently, the arc burns steadily. Iron ore is used to accelerate the formation of the main sediment and to transfer phosphorus to the sediment, iron ore greatly contributes to this process. Depending on the condition of the bottom of the oven, lime is put on the bottom of the oven or thrown on the scrambled skrap. Iron ore is deposited on the bottom of the bow furnace or on top of a shiny metal part. When the liquid casting is completed, the liquefaction period begins — the electrodes are lowered and the current is applied. Under the influence of the arc, the spike under the electrodes is liquefied and the electrodes begin to gradually descend; At this point, a well with a diameter of 40-70% larger than the diameter of the electrode is formed. Unliquefied pieces of the bottle are injected into a liquid metal bath. In order that the radiation of the powerful arcs does not damage the dome, it is necessary to drill wells (solidified formations) ≪bridge≫ Shear begins at low tension, then is worked at greater tension and the longest arc. At the end of the pumping, the tension is lowered and the arc length is reduced.

PART OF THE EXPERIENCE.

JSC "Almalyk KMK" in the foundry shop of the Central Repair Mechanical Plant in the electric arc furnace DS-5MT in accordance with the requirements of GOST 977-88 in accordance with the requirements of GOST 977-88 was melted and cast iron samples taken as samples were taken from this solution to check the hardness of the laboratory of the Tashkent State Technical University There were several research studies in INDUCTION MELTING FURNACE (INDUCTION MELTING MACHINE). From these studies, we took ferrochrome as an example, which gave the best results.

When added to steel, ferrochrome provides several advantages, namely, increases hardness and toughness, improves anti-corrosion properties, increases liquid viscosity, increases oxidation resistance when superheated.

Tashkent State University, Department of Casting Technologies casting in laboratory conditions 60x40x20 mm on January 26, 2020 in the mechanical shop of the Central Repair Mechanical Plant of JSC "Almalyk KMK" on a universal lathe S11MV branded cutting and cutting work for 2 hours 45 minutes was prepared for determination of hardness, chemical properties and structure of these metals.

Metals made on a universal lathe together with scientists, professors of the Tashkent State Technical University SN-EU 2250172 were examined under a special microscope the structures of steel brand 110G13L and the structures of ferrochrome as a modifier to this steel were examined under a special microscope and the desired results were obtained.

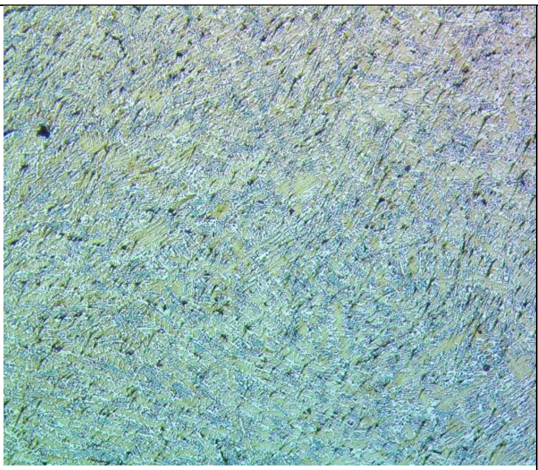	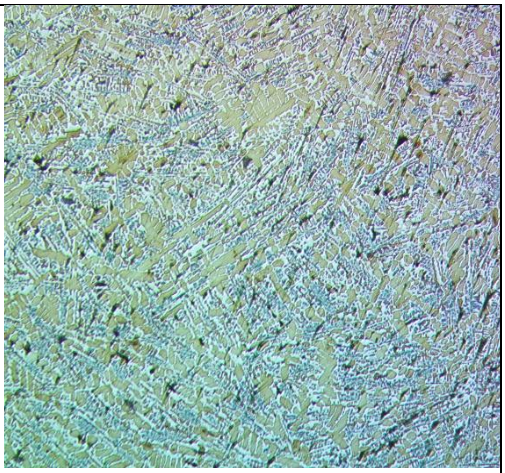
Figure 1. View of 110G13L-marked steel structure with a magnitude of 5μm.	Figure 2. 110μm view of a 110G13L-marked steel structure.

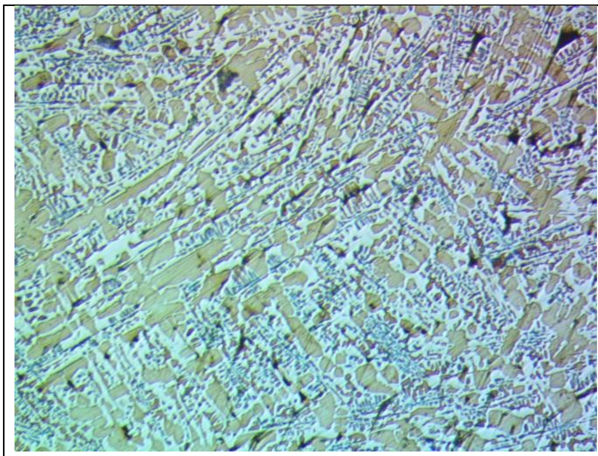

Figure 3. View of 110G13L-marked steel structure at 20μm magnitude.

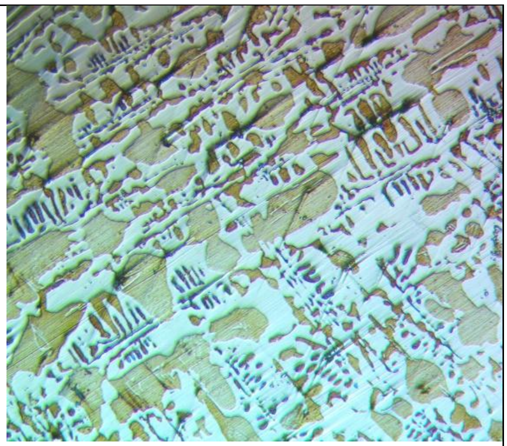

Figure 4. View of 110G13L-marked steel structure with a size of 50 μm.

View of unmodified 110G13L branded steel structure with different sizes.

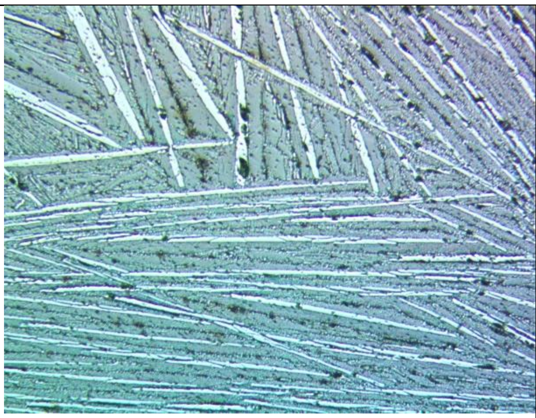

Figure 5. View of 110G3L branded steel with the addition of 1% ferrochrome as a modifier with a size of 5μm.

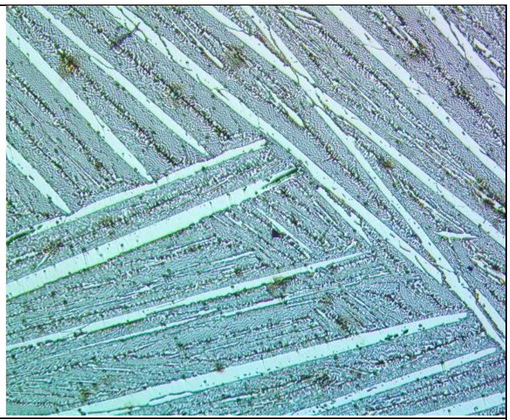

Figure 6. View of 110G3L branded steel with the addition of 1% ferrochrome as a modifier 10μm.

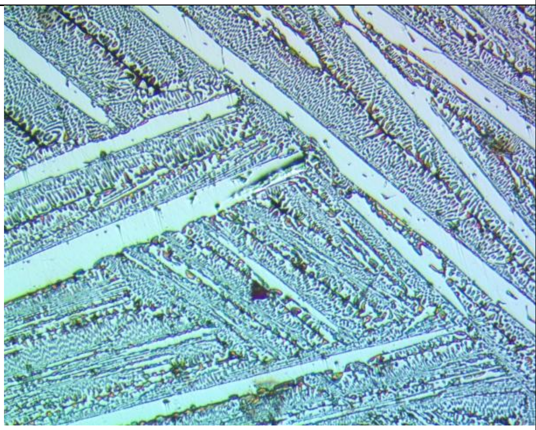

Figure 7. View of steel brand 110G3L with 1% ferrochrome added as modifier 20μm.

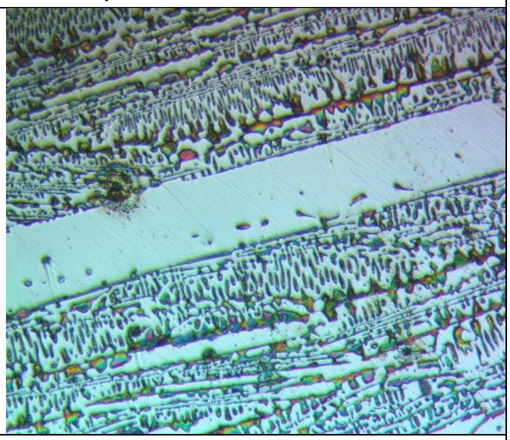

Figure 8. View of 50μm size of brand steel 110G3L with the addition of 1% ferrochrome as a modifier.

View of structures detected when 110G13L grade steel is added with 1% ferrochrome.

With an increase in the amount of manganese in carbonaceous steels, the austenite in the structure gradually begins to stagnate, as a result of which the structure of the alloy in cast or after normalization passes from perlite to sorbit, trossite, martensite, and finally austenite.

Manganese austenitis is characterized by its unpleasantness and is prone to crunching. Such steels

are mainly used to increase eaten tolerance in conditions where forgiveness occurs on the surface layer of the metal. And under conditions of abrasive wearing, the surface layer of such steel material does not wear out, therefore in such conditions the use of brand steel 110G13L has no advantage over other mechanical steels.
It is well known that the amount of carbon in steel has a strong impact on its eating tolerance, so in some cases increasing the carbon content of steel to 1.5% leads to a number of complexities.

Chemical Properties,%:

No	Naimenovaniye materiala	C	Si	Mn	P	S	Cr	Ni	Mo
	St110G13LFeCr3%	0,78	0,40	14,39	0,066	0,022	1,13	0,081	0,58

At JSC "Almalyk KRK" a large quantity of various parts (crushers of different categories, parts, teeth of excavator buckets, etc.) made of steel 110G13L are used. The surfaces of such parts become unfit as a result of being subjected to forging abrasive or abrasive wear under various operating conditions. As a result of this, the enterprise collects a large amount of manganese steels. In order for such steels to have a structure that allows increasing their wear tolerance, microalloying and modifying them in the process of dissolving are considered desirable.

The study of the structure of the above-mentioned modifiers is ongoing.

References

1. As a result of theoretical and practical research on the selection of the optimal modifier to improve the elasticity of parts cast from Gadfield steel, the following recommendations have been developed:

2. Optimal modifier classification and composition have been developed to improve the strength of steel parts;

3. The general properties of 110G13L branded steel were studied.

4. In order to increase the durability of steels, several types of modifiers were selected and their properties studied.

5. Mechanical and chemical properties were tested at plant of MTM (SRMZ) and TSTU laboratory conditions.