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MAHALLIY XOM ASHYOLAR ASOSIDA PAYVANDLASH ELEKTRODI QOPLAMALARINI OLISH TEXNOLOGIYASI

Anotatsiya: Ushbu ilmiy ishda payvandlash elektrodi uchun xom ashyo butunlay mahalliy xom ashyo asosida yaratilgan. Bu ilmiy ishda 10 ta yangi namuna tayyorlangan va 370˚K da payvandlash elektrodini ishlab chiqarish uchun 6 marta dastlaki laboratoriya o’tkazish natijasida olingan ma’lumotlar import mahsulotlar bilan solishtirilgan va ularning o’sish ko’rsatgichlarining solishtirma diagrammalari tuzilgan.

Kalit so'zlar: elektrod, payvandlash, komponent, kvarts, qum, dolomit, kaolin, rutil, titan (II) oksidi, ferroagentlar, marmar kukuni, ferrotitan, slyuda, bor, kraxmal, dala shpati, sellyuloza.

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ТЕХНОЛОГИЯ ПОЛУЧЕНИЯ ПОКРЫТИЙ СВАРОЧНЫХ ЭЛЕКТРОДОВ НА ОСНОВЕ МЕСТНОГО СЫРЬЯ

Аннотация: В данной научной работе сырьё для сварочного электрода было полностью разработано на основе местных ресурсов. В рамках исследования были изготовлены 10 новых образцов и проведены 6 предварительных лабораторных испытаний при температуре 370^{o}K. Полученные результаты были сопоставлены с импортными электродами, а также построены сравнительные диаграммы показателей роста.

Ключевые слова: электрод, сварка, компонент, кварц, песок, доломит, каолин, рутил, оксид титана (II), ферроагенты, мраморный порошок, ферротитан, слюда, бор, крахмал, полевой шпат, целлюлоза.

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TECHNOLOGY OF OBTAINING WELDING ELECTRODE COATINGS BASED ON LOCAL RAW MATERIALS

Abstract: In this scientific study, raw materials for welding electrodes were developed entirely based on local resources. Within the scope of the research, 10 new samples were prepared and six preliminary laboratory tests were conducted at a temperature of 370^{o}K. The obtained results were compared with imported electrodes, and comparative diagrams of the performance growth indicators were developed.

Key words: electrode, welding, component, quartz, sand, dolomite, kaolin, rutile, titanium(II) oxide, ferroalloys, marble powder, ferrotitanium, mica, boron, starch, feldspar, cellulose

INTRODUCTION

At present, the range of welding electrodes produced is expanding, gaining particular competitiveness in the world market. One of the important tasks is to ensure their quality, increase the durability and service life of structures and equipment. Extensive scientific research is being conducted in the world by leading scientific centers and higher educational institutions of the world, aimed at developing energy- and resource-efficient welding production technologies [1-3].

Currently, expensive imported raw materials are used in the production of electrode coatings. Due to insufficient attention to the study of the problems of the integrated use of mineral raw materials and the formation of a weld metal with high physical and mechanical properties, the cost of coated electrodes for arc welding is increasing, and the production of coated electrodes using local mineral raw materials is limited [2-5]. The essence of these problems is that in order to ensure the integrated use of local raw materials, it is necessary to develop a scientific basis for the selection of materials and components of the charge composition [6-8].

Today, the number of industrial sectors related to metal processing is increasing in our republic. 30 thousand tons of electrodes used for welding are exported to our country annually, mainly from China. As a result of the implementation of electrode production technology and the establishment of production facilities, new types of products are produced based on local raw materials. This, in turn, leads to the production of products that can replace imports and save foreign exchange [9-10]. In addition, 98% of the raw materials that will go to the products planned for production are available in our republic. The product is environmentally friendly and its efficiency is not inferior to that of analogues [10-12].

Research methods and objects. Research to determine the optimal option of the coating necessary for the electrode from the structural point of view in laboratory conditions. The importance of drying coatings from 90^{o}C to 180^{o}C using a reactor was studied based on calculations. All substances are measured with high precision on an electronic analytical balance [12-14].

Results and discussion. The electrode fillers are rutile, titanium(II) oxide, ferromanganese, marble powder, ferrotitanium, mica, boron, starch, feldspar and cellulose.

Table 1

Composition of local products coated for one electrode,%

Local raw material Name	**Experimental images, %**									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Rutile	11	12	13	14	**15**	17	18	19	20	21
Titanium (ll)-oxide	5	5	4	4	**3**	3	2	2	1	1
Ferromargens	5	6	7	8	**9**	10	11	12	13	14
Mica	2	3	4	5	**6**	7	8	9	10	11
Marble powder	5	5	7	7	**8**	9	7	5	4	1
Ferrotitanium	36	34	32	30	**28**	27	26	25	24	23
Boron	8	9	10	11	**8**	4	5	6	7	8
Starch	12	11	10	10	**9**	8	7	6	5	4
feldspar	10	10	9	8	**11**	12	13	14	15	16
Cellulose	6	5	4	3	**3**	3	3	2	1	1

The most optimal option was determined through 10 experiments conducted in the laboratory, localizing these substances (Table 1). It was found that the electrode consisting of rutile (15%), titanium (II) oxide (3%), ferromanganese (9%), maromar powder (8%), ferrotitanium (28%), mica (6%), boron (8%), starch (9%), feldspar (11%), and cellulose (3%) gave a higher effect than the electrodes with the remaining compositions.

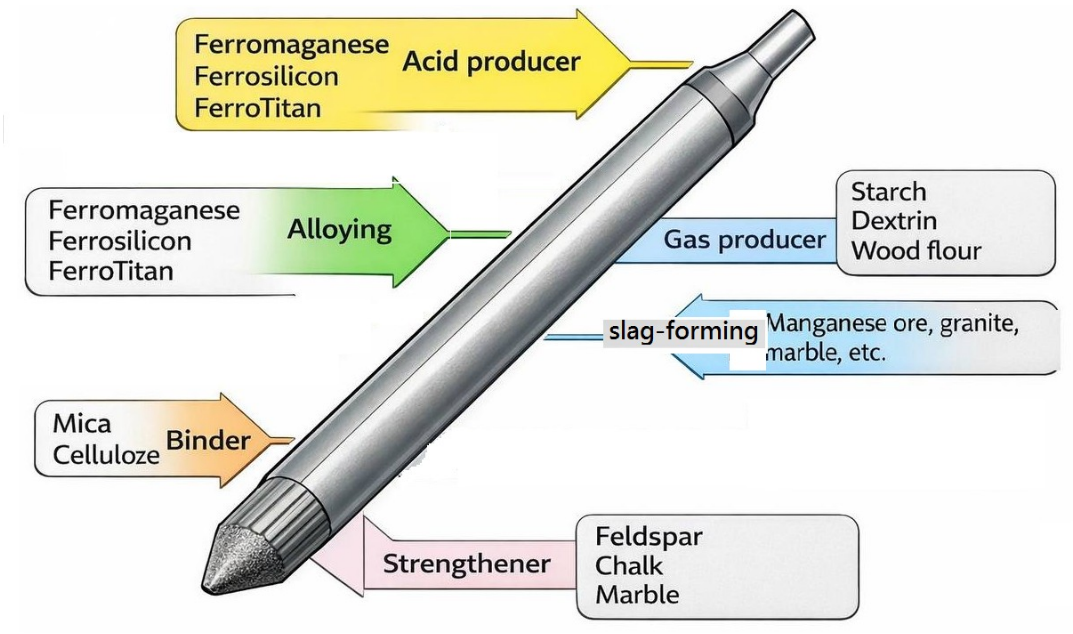

Figure 1. Electrode components and their functions

Table 2

Effect of Temperature on the Components of Welding Electrode

Sequence number	**Experimental samples 273°K**					
	1	**2**	**3**	**4**	**5**	**6**
1	10	20	**20**	10	20	**40**
2	40	40	**40**	15	35	**50**
3	70	60	**65**	20	50	**60**
4	100	80	**95**	25	65	**70**
5	130	100	**125**	30	80	**80**
6	160	120	**150**	35	95	**90**
7	190	140	**170**	40	110	**100**
8	220	160	**180**	45	125	**110**
9	180	150	**170**	50	140	**120**
10	160	130	**135**	55	155	**130**
11	130	110	**107**	60	170	**140**
12	100	90	**80**	65	185	**150**
13	70	70	**50**	70	200	**160**
14	40	60	**30**	75	215	**170**
15	10	40	**10**	80	230	**180**

Initially, as the temperature rises, the gas-forming substances in the electrode components melt. As a result, the substances on the surface of the electrode stick to the wire rod (Fig. 2). When the heating process is raised to 180°C, the hardeners ensure that all the components adhere firmly to the metal rod. The temperature is then lowered during the process so that the components gradually solidify.

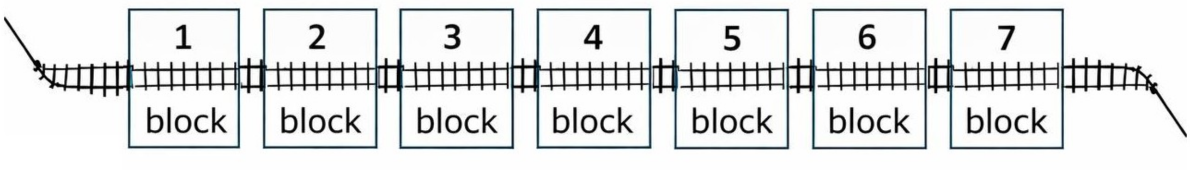

Figure 2. Description of the drying process.

It has been experimentally proven that carrying out the process at constant high or low temperatures has negative consequences (Fig. 3). Conducting the heating process at a constant temperature of 180°C has been shown to adversely affect the brittleness of the electrode components and the activity of the slag-forming substances. For example, the above situation was observed in experiments 1 and 5.

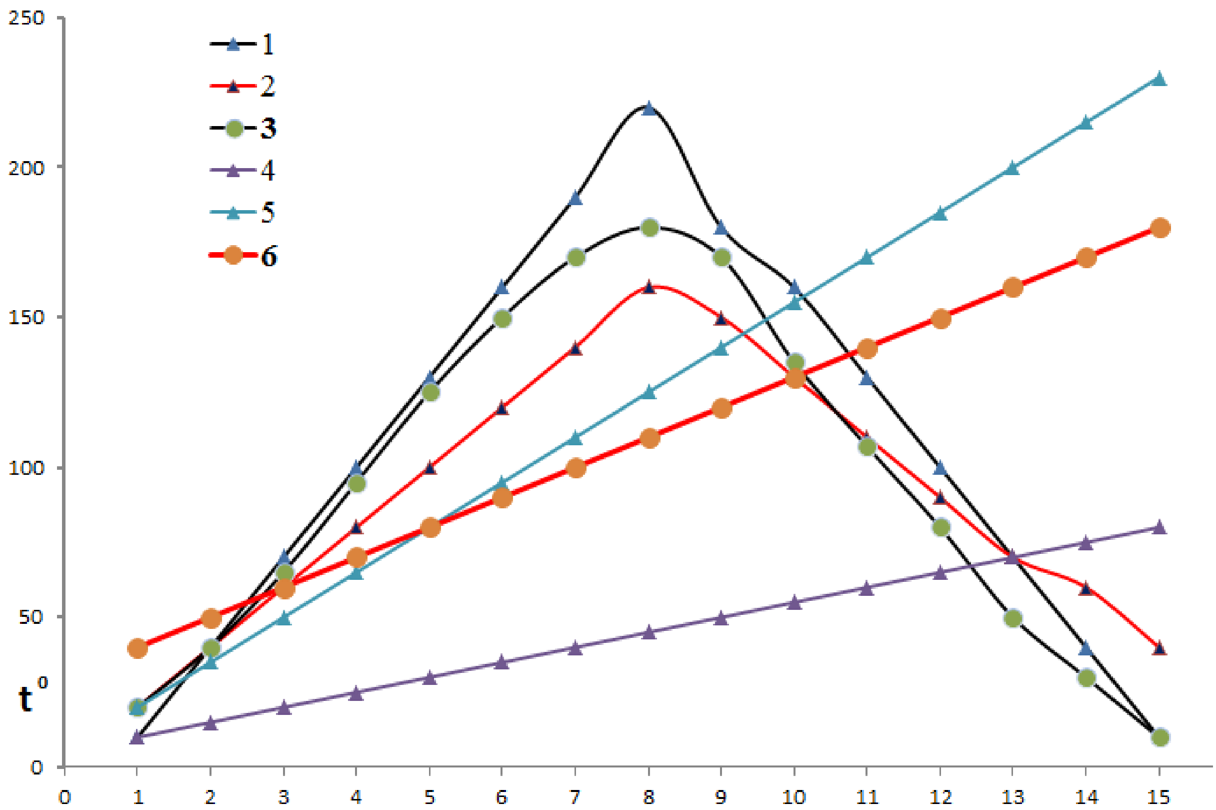

Figure 3. Diagram of temperature change of heating columns t^0

If the heating process is carried out at a constant temperature below 180°C, it leads to a destruction of the function of gas-forming and stabilizing substances (experiments 2 and 4). As a result, the components on the surface of the metal rod became brittle. As a result, the electrode components begin to disintegrate, unable to withstand weak mechanical action. During welding, the electrode life is reduced and the casting continuity is lost. Experiments 1-6 show that in experiments 3 and 6, the composition of the electrode components did not change. But it takes 3-4 hours to cool the electrodes from the 6th experiment. The drying section produces finished product after the third experiment. The electrode obtained in this experiment is strong in all respects. Its welding continuity and casting time fully meet international standards.

The welding electrodes consist of a metal rod with a coating on the top. Occasionally there are uncoated electrodes on the top. Metal rods or welding wire is a actually molten electrode. Welding wires used in the manufacture of electrodes are produced with a diameter of 1 - 12 mm and a length of 450 mm.

A single electrode with a diameter of 4.0 mm weighs 51.3 grams and 5 mm 78.1 grams. There are a number of parameters to consider when optimizing welding work. In addition to the most important parameters that directly affect the physicochemical properties of the result of the work - the type of electrode coating, the weight of the electrode should be taken into account, depending on the type of surface.

The electrodes are coated with diameters from 2.5 mm to 4 mm. Often, to determine the need for electrodes, the person in charge calculates the consumption of electrodes per 1 p/m of suture. This method allows you to control the individual consumption of electrodes. It is known that the weight of the electrode is affected by diameter, length, type of coating and other factors.

We compare the weight, diameter and length of the new electrode with the Swedish KO 53.7 electrode and the Japanese LB-52U electrode.

Swedish KO 53.7 and Japanese LB-52U electrode specific gravity with new electrode.

Table 3

Swedish KO 53.7 electrode Japanese LB-52U electrode new electrode comparison.

Samples	Physical properties				
	Diameter (mm)	Length (mm)	Package weight (kg	Single electrode weight (g)	Number of electrodes in the package (pieces))
Swedish KO 53,7 electrode	2,5	350	4,5	18,8	240
	3,2	350	4,7	30,7	153
	4	450	6	63,2	95
Japanese LB-52У	2,6	350	5	20	250
	3,2	350	5	31	161
	4	400	5	53	94
	5	400	5	82	61
New electrode	2,4	450	5	20,8	240
	3,0	450	5	31,3	160

A good knowledge of the properties of the above products allows us to increase the required efficiency of the welding electrode and reduce the consumption of the electrode. The electrodes are also divided into thin-coated and thick-coated electrodes. Thin-coated electrodes make the wire more stable. The thin coating makes the wire more stable. The most common coatings are chalk and liquid glass coatings. Therefore, high-quality welding is not accomplished with thin-layer coating. Therefore, thick-coated electrodes are often used. Welding electrodes are required for the construction of metal structures, the connection and repair of various metal parts. The welding electrodes form a weld that is a strong "bridge" between the connected elements. Welding electrodes are used in both home construction and mass industrial facilities, there are more than 200 types of welding, about half of which are specially designed for manual welding. The following can be done with a welding electrode: joining two metal parts, welding of cracks, cutting of individual parts of metals and metal devices; Welding electrodes are also used to liquefy various metal parts that have changed their natural geometric dimensions and become obsolete during operation. As the amount of nitrogen and oxygen in the weld metal increases, the metal becomes less brittle and more brittle. Therefore, when creating a coating for welding electrodes, all the requirements that allow to reduce the amount of oxygen and nitrogen in the molten metal are met.

CONCLUSION

Instead of thin-walled welding electrodes, it is advisable to use thick-coated electrodes, which allow for high-quality welding and make it more convenient. This is because the thick coating of the welding electrode contains oxidizing and slag-forming substances.

The presence of large amounts of slag allows the weld to be protected from environmental factors, so these electrodes are an excellent choice for welding critical structures. Most deposits contain elements such as silicon, manganese, sulfur, phosphorus, and carbon. Using thick-walled welding electrodes, it is possible to weld important metal structures without compromising quality.

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