ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
Vol. 7, Issue 5 , May 2020

Mineral resources of the Republic of Uzbekistan for the production of electrode coatings of electrodes for wear-resistant

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ABSTRACT: This article presents the features of the composition and properties of electrodes for wear-resistant surfacing and mineral resources of the Republic of Uzbekistan for the production of electrode of this type of coating

KEY WORDS: manual arc surfacing, electrode, ferroalloys, marble, pegmatite, surfacing coefficient

I. INTRODUCTION

Manual arc surfacing has a wide range of applications, effective in terms of technical and economic indicators: the possibility of applying a metal layer of a sufficiently large thickness (in comparison, for example, with diffusion deposited deposition), maneuverability and simplicity, transportability and prevalence in terms of power sources, applicability in combination with others surface treatment methods (thermal, mechanical, etc.), the possibility of using it for many metals and alloys, the possibility of obtaining the most diverse composition of deposited metal, the cost-effectiveness of surfacing parts with uneven wear.

II. LITERATURE SURVEY

The electrodes that provide low-carbon low-alloy weld metal of medium hardness (HB 260-450) are used for surfacing parts working under friction metal-to-metal, including in the presence of intense impact loads. In general terms, these electrodes are not characterized by the stability of the operational characteristics of the deposited metal, due to its structure (troostite, troostosorbitol), which is very sensitive to the cooling rate of the deposited part. To a much lesser extent, this applies to electrodes of the OZN-300M OZN-400M grades, which also provide increased wear resistance due to doping with silicon [1].

An increase in the carbon content in the low alloy deposited metal (electrodes of the EN-60M, 13KN / LIVT grades and others) leads to higher hardness indices associated with martensitic transformation and wear resistance. This allows the use of electrodes for more difficult operating conditions: cold stamping dies (electrodes of the TsN-14, EN-60M grades), a bulldozer knife (13KN / LIVT electrodes) [2].

The optimal system and level of alloying allows me to achieve enhanced characteristics of the deposited carbon alloyed metal, which is implemented in electrodes of the grades TsN-16, OZN-6 (type of weld metal 180B8Kh6GS, 90S4Kh4G2R1, respectively). Such metal is resistant in conditions of shock-abrasive wear, and OZN-6 electrodes provide hardness of 65 HRC already in the first layer, as well as the possibility of multilayer surfacing. Additional alloying of a metal of close composition with nitrogen and vanadium gives its high characteristics at low temperatures and allows surfacing of parts made of steel 110G13L (electrodes of the OZN-7 grade, type of deposited metal 60X4G4SZRAF) [3].

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The weld metal of the composition of chromium steels obtained by using electrodes of the UONI-1Z / 20Kh13, VSN-10, OMG-N grades possesses sufficient wear resistance under various conditions. When the carbon content is up to 0.3%, high corrosion resistance is also provided [4].

A diverse range of compositions and properties are electrodes that provide highly alloyed weld metal. Thus, austenitic chromium-nickel deposited metal doped with silicon (electrodes of the grades TsN-6L, TsN-12M, TsN-18, successfully used for sealing surfaces of power fittings operated under metal-to-metal friction at elevated temperatures and pressures and corrosion-erosion wear) TsN24), instead of cobalt stellite (electrodes of TsN-2 brand). In nuclear energy and chemical engineering, to obtain a corrosion-resistant surface of products, niobium-stabilized chromium-nickel or chromium-nickel-molybdenum deposited metal is used (electrodes of the grades EA898 / 21V, EL455 / 51, EA-582/23) [5].

Dispersion-hardening compositions of highly alloyed weld metal can effectively achieve the required performance characteristics of the deposited products. The hardening effect is achieved due to phase and structural transformations during heat treatment or under the influence of operating conditions. For surfacing of heavy-weighted die tooling, OZSh-6 brand electrodes are used, which make it possible to heat treat products in a wide temperature range close to those recommended for tool and die steels and the highest heat resistance of the deposited metal; for corrosion-resistant fittings - electrodes of the UONI-13 / N1-BK brand [1].

High-carbon chromium-tungsten compositions of the deposited metal, characterized by high wear resistance during abrasive wear with impact loads, provide electrodes of the grades VSN-6, VSN-8 [2,3]

The compositions of high-chromium cast irons, which are resistant in conditions of intensive abrasive wear, provide electrodes of the grades C1, T-590, T-620 [5].

Since surfacing is carried out, as a rule, in the lower position, less stringent requirements on welding and technological properties are imposed on the surfacing electrodes than on welding electrodes. A number of deposited surfaces after surfacing is not subject to mechanical treatment, which reduces the level of requirements for the quality of slag separability for them [7].

III. METODOLOGY

The electrodes for surfacing in the vast majority have basic coatings. This allows, due to the low hydrogen content in the deposited metal, to provide its better resistance to cracking during surfacing of parts from steels with a high carbon content, hard products. The developed composition of the electrode coating for wear-resistant surfacing contains the following components, wt.%: Marble - 26-28; pegmatite - 14-16, graphite - 9-11, ferrosilicon manganese - 10-12; ferrochrome 25-27; ferrotitanium - 10-12.
The use of mineral resources of the Republic of Uzbekistan for the development and industrial production of electrode coatings for wear-resistant surfacing is an urgent task.

Analysis of marble deposits in the Republic of Uzbekistan showed that the chemical composition (according to GOST 4416 - 73 “Marble for welding electrodes”) marble deposits Sovuk Bulak (Kashkadarya region), Gazgan (Navoi region), Aksakata (Tashkent region) for the content of standardized components is suitable for the production of welding materials (table 1. and 2). The results of mineralogical analysis showed that finely and coarse-grained marble in the section consists of 99-100% of calcite grains with a diameter of 0.3 to 1.5 mm.

Table 1.

Deposits and estimated reserves of marble resources of the Republic of Uzbekistan

№	Field	Location	Volume of output, thousand m3 per year	Characteristic
1	Sovukbulak	Kashkadarya region	40,0	Dark gray, medium grain, massive texture, banded texture

ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
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2	Gazgan	Navoi region	30,0	Cream, gray to black, fine-grained
3	Aksakata	Tashkent region	10,0	Small-block, cream-colored with shell-shaped patterns, coarse-crystalline

Table 2
The chemical composition of marble (wt.%)

№	Chemical composition	Sovuk bulak	Gazgan	Aksakata
1	CaO	48,3	53,0-55,0	48,6-54,55
2	MgO	4,23-4,81	0,01	1,05-2,42
3	K_2O	-	0,1	0,1-0,13
4	Na_2O	-	0,1	0,1
5	SiO_2	1,62-1,87	0,8-1,0	1,53-9,44
6	Al_2O_3	0,2-0,63	0,2-0,3	0,03-0,89
7	TiO_2	-	0,01	0,02-0,03
8	Fe_2O_3+FeO	0,63-0,84	0,1-0,2	0,18-0,39
9	P_2O_5	-	-	0,04
10	CO_2	39,7-43,23	42,0-43,0	39,57-42,9
11	SO_3	-	-	0,1

As a result of the analysis of information on feldspar, the chemical composition of which is the aluminosilicates of potassium, sodium, calcium and barium, it is revealed that in Uzbekistan the main sources of feldspars are mainly granite pegmatites. Lolabulaksky deposit of granite pegmatite is located in the Chirakchi district of Kashkadarya region. The chemical composition of pegmatite of the Lolabulakskoye field is shown in table 3.

Table 3.
The chemical composition of pegmatite

Name of the field	Location	Content,%						
		SiO_2	Al_2O_3	Fe_2O_3 +FeO	CaO	K_2O	Na_2O	K_2O+ Na_2O
Lolabulakskoe	Kashkadarya region	67,0	19,15	0,06-0,47	0,28	4,15	7,08	0,59

The electrode rod material is Sv-08A welding wire in accordance with GOST 2246-70 (Table 4).

Table 4
The average chemical composition of the electrode rod material,%

Wire mark	C	Si	Mn	Cr	Ni	Al	S	P
Св-08А	≤0,10	≤0,03	0,35-0,60	≤0,12	≤0,25	≤0,01	0,030	0,030

A comparative analysis of the studied deposits of the Republic of Uzbekistan confirms the possibility of industrial production of almost all types of mineral raw materials necessary for the production of welding electrodes for wear-resistant surfacing.

IV.CONCLUSION

Developed electrodes for wear-resistant surfacing containing the following components, wt.%: Marble - 26-28; pegmatite - 14-16, graphite - 9-11, ferrosilicon manganese - 10-12; ferrochrome 25-27; ferrotitanium - 10-12, provide:
- surfacing of parts operating under conditions of predominantly abrasive wear with moderate impact loads. Typical hardness of weld metal is 58-65 HRC;
- surfacing in the lower and inclined positions by direct current of reverse polarity. Deposition ratio 9.3 g / A • h;
- electrode consumption per 1 kg of weld metal - 1.3 -1.5 kg

ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 7, Issue 5 , May 2020

ACKNOWLEDGMENT

This work was carried out in the framework of a business contract with the Tashkent Pipe Plant named after V.L. Halperin No. 9/2020 on the topic: "Development of coating composition and production technology of surfacing electrodes"

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