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Receiving antifriction materials on the basis of waste of metallurgical productions of Uzbekistan

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ABSTRACT: One of current problems of modern production is use of different production wastes, in particular metallurgical. The method of powder metallurgy allows to use waste of metallurgical productions. It is used in this work on receiving antifriction porous material on the basis of iron. It is used the iron powders received at the Uzbek plant of high-melting and heat resisting materials by recovery of scale of Bekabad metallurgical plant. In quality at the fast material is used in pyrite withdrawal of production of the Almalyk mining and processing iron and steel plant. Tests showed on a possibility of production ceramic-metal iron of graphite antifriction alloys with pyrite additive on the basis of local raw materials.

KEY WORDS: antifriction alloy, iron powder, pyrite.

I. INTRODUCTION

The main requirement to constructions of different function is their maximum use at the minimum costs of production. One of the conditions of achievement of maximum efficiency is decrease in materials consumption at simultaneous use of modern manufacturing techniques of details. In constructions frictional units most purely fail that conducts to additional costs of spare parts and losses of technological time. In this regard big application in mechanical engineering is found by antifriction details by the received method of powder metallurgy [1,2].

This method allows to receive details with given sizes, physic-mechanical properties and chemical composition. At the same time the utilization coefficient of material makes 0.95-0.98 [3].

Firms the releasing recovered iron powders, as raw materials use either clean ore concentrates, or pure rolling scale.Hyoganes Corporation and also the Japanese and Chinese firms releasing iron powders, as raw materials use rolling scale. The main consumer of powder products is automotive industry. The mass of powder details constantly grows in cars is approximately (12-15 kg on the European car).

In our case, objects were the products received during the pressing and agglomeration of powders from local raw materials.

Iron powders were received at the Uzbek plant of high-melting and heat resisting materials by recovery of iron scale of Bekabad metallurgical plant. Recovery was carried out among drained hydrogen at a temperature of 1100-1150 °C. As sulfur-containing additive used the pyrite which is withdrawal of the Almalyk mining and metallurgical production.

The received powders of iron corresponded to ПЖВ5, 450.24 and ПЖВ5.160.28 brands of the Russian production in accordance with GOST 9849-86.

II. RESEARCH PART

For drawing up a blend used graphite and pyrite. Graphite took element or pencil in accordance with GOST 4404-78 "Graphite for production of pencil rods. Specifications". Pyrite used after crushing to fraction 0.45-0.16 mm.

Mixing of powders and preparation of a blend were carried out in conical mixers with additive of gasoline and stearate of zinc. Content of graphite was constant – 2%. Content of pyrite was: 0.5; 1.0; 1.5; 2.5; 3.0; 3.5; 4.0%. After

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preparation of a blend samples, necessary for tests, prepared (were pressed) according to the required sizes and a configuration for test pieces on stretching, compression.

Tests was carried out according to GOST 25698-83 – "Powder products. Methods of determination of hardness"; GOST 18227 Materials powder. Test methods on stretching. Samples in the form of plugs put on trials for radial compression in accordance with GOST 26529-85 – "Materials powder. A test method on radial compression". In compliance strength at radial compression decided on this state standard specification

$$\sigma_{р.сж}=\frac{P_{max}(D-a)}{L\cdot a^2} \quad (1)$$

whereP_{max} – the maximum rupture load;
D – outer diameter of the plug;
a – plug wall thickness;
L – length of a cylindrical part of the plug.

The pressed samples were exposed to agglomeration. For this purpose pressings packed into containers from stainless steel then were covered with an asbestos leaf. On an asbestos leaf pig-iron shaving about 40 mm thick was filled, the container was closed by a cover, and slots were coated with refractory clay. Agglomeration was carried out at a temperature of 1100 °C within 2 hours. After agglomeration containers cooled on air.

The received samples put on hardness tests, durability according to the above-stated standards.

Density and porosity defined according to GOST 18398-73 – "Powder metallurgy. Methods of determination of density and durability". Oil content in the impregnated powder products was determined by a weight method in accordance with GOST 24903-81.

From each lot of products not less, than on 3 samples prepared microsections and carried out the metallographic analysis on a microscope of MIM-6M. of a research carried out after etching of microsections 4% by HNO_3 solution in ethyl alcohol according to GOST 901-78 at increases in 100 and 300 times.

As initial materials used the iron powders received by recovery of iron scale of Bekabad metallurgical plant. Recovery was made at the enterprise the Uzbek plant of high-melting and heat resisting materials by heating of scale in the atmosphere of hydrogen. The recovered powder underwent additional grinding then carried out sifting on sets for obtaining required particle size distribution. The technical composition of the prepared powders corresponded to GOST 9849-86. As a sulfur-containing component added production pyrite the Almalyk mining and smelting plant the particle sizes of 0.1-0.071 mm.

From initial materials were prepared a blend by mixing of powders of iron, graphite elementary the GE-Z brand and pyrite. The basis of the received alloys selected the structure corresponding to Zhgr2 alloy grade. Pressing of products was carried out on the KO628 press submachine gun with a productivity of 15 samples a minute. Agglomeration was carried out in containers from stainless steel with a charge of details pig-iron shaving at a temperature of 1100 °C within 2 hours.

The received products and samples were put on mechanical tests, metallographic researches. Results of tests are given in fig. 1.

Apparently from the drawing, technical properties of the graphite alloys sintered iron received from production powders the Uzbek plant of high-melting and heat resisting materials answer specifications of plant.

Introduction to a blend of pyrite from 0.5 to 1.5% leads to some decrease in density and growth of absorbency oil. It is followed by some decrease in hardness and durability, however at pyrite content up to 1% all properties meet the qualifying standards.

The microstructure of alloy represents a ferrite-perlite basis in which sections of inclusions of graphite and sulfides are visible.

At contents more than 2% of pyrite sharply increase in a blend porosity that it is necessary to connect with gas generation at decomposition of FeS_2 in the course of agglomeration. Growth of porosity leads absorbency oil to decrease in density and increase. Strength properties and hardness sharply decrease.

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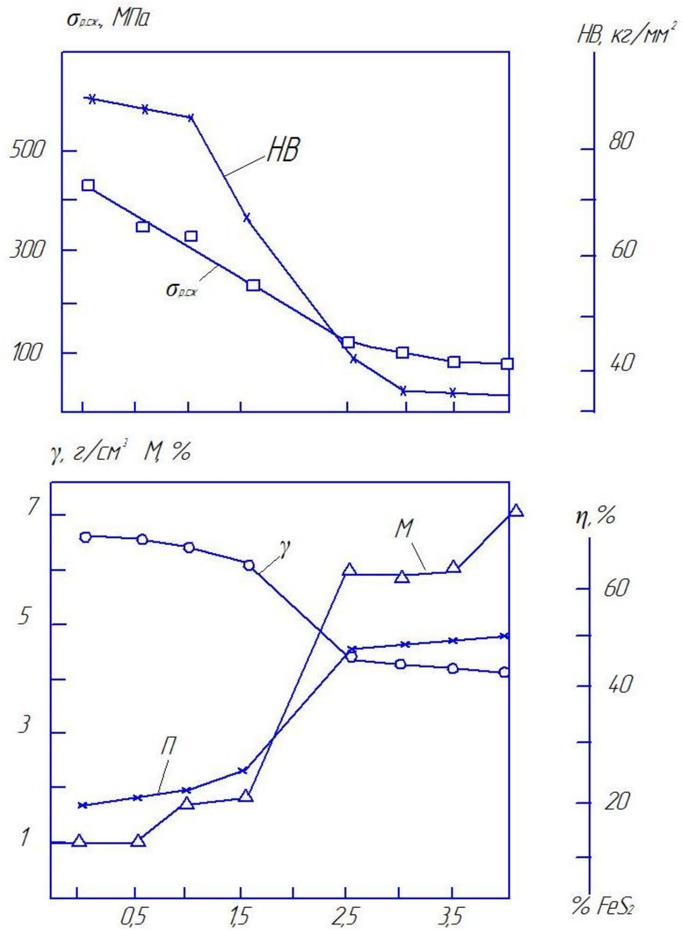

Fig. 1. Dependence of hardness of HB, durability on radial compression $\sigma_{р.сж}$, density of γ, porosity П, oil of absorbency of M of porous antifriction alloy on the basis of iron from contents in a pyrite blend

III.CONCLUSION

On the basis of the conducted researches it is possible to draw the following conclusions:

1. The iron powders meeting the requirements of the standard can be received by recovery of scale of Bekabad metallurgical plant in the conditions of the Uzbek plant of high-melting and heat resisting materials.
2. Production of iron powders at the Uzbek plant of high-melting and heat resisting materials is quite reasonable since at the expense of cheap raw materials' cost will be lower than import.
3. By production of porous antifriction products as sulfur-containing additive pyrite – withdrawal of production of the Almalyk mining and smelting plant can be used.
4. The sintered antifriction ceramic-metal alloys received from local raw materials meet the requirements of specifications.

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