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THE ANTIFRICTIONS POWDER COMPOSITION MATERIALS ON THE BASIS OF THE IRON

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Abstract: the article is dedicated examination of the antifriction qualities to "iron - cast iron - brass" on the basis of the production instep wastes of the cast iron. It is established that in case of the application of the technology of the cold pressing in "sweating" layer stencil, without application of the technological grease and in the following sintering with the temperature 1200°C with the isothermal quotation in the zone Sintering 1 hour on the surroundings endothermic gas physical - mechanical and anti-friction qualities are raised almost 2 times as a result of actively drainages of the gases from the press form.

INTRODUCTION

Today introduction many construction units from powder metal materials numbers of items and with very good ability for reproduction are produced in sizes with regard to dimensions and qualities. They offer in most cases near reasonable also considerable technical renewals. New technological knowledge and progress in the sinter technology has the range of application for powder metal - construction units practically on all areas of the technology expanded, so that today these products are spread very far. In the follower can typical powder metal - construction units and their applications be listed:
electric power tools (plate wheels, gearwheels, etc.)
hydraulics and pneumatics (rotors, to valves, high-loaded Pleuel, axial butt etc.)
engines (cam, clutch parts, valve seat rings, slip pieces, Pleuel, driver etc.)
transmission (gearwheels, switch forks, synchronous rings etc.)
conveyor technology (sprockets, links in a chain, thrust bars etc.)
energy technology, turbines (pumping parts, close etc.).

There are naturally today interesting and very effective powder metal-steels, powder metal non-materials. As an example to the production of sinter construction units to applied materials play with Cu, Ni, Mo, P and C alloyed powder metal - steels the dominant roll. From the powder metal - to non-materials will use mainly the powder metal - bronze with 9 to 11% Sn because of their corrosion resistance, electric and thermal conductivity as well as their good antifriction properties in the powder metal - construction unit manufacturing [1]. The wear-resistance of construction units takes with the practical application of engines a special position. According to the Federal Ministry for research and technology approximately 4.5% of the Gross National Product devour friction, wear and corrosion in the industrial countries. Converted on the federal republic the about 70Bn. DM of economical losses mean every year [2]. The big economic importance (meaning) of the tribology demands of materials for engines elements near good mechanical and physical qualities also positive tribology qualities.

Coating and connection of materials of the powder metallurgy and ceramics have attained a high value in the current modern technology. This is considered particularly in connection with questions for the improvement of the wear-resistance, the tribology in

general, the temperature lastingness etc with problems of the warm administration or the warm crossing group solutions play among other things an important roll.

It is known, that the profitability with the capacity of the enterprise 1 Mill. t. Production in the year for traditional hut production supplies. The profitability of the powder production and make of them with the use instep wastes in a row of the cases can be already supplied with the range of the production 100 t/years. But the optimal the level of the capacity is 1000-5000 t/year according to the powder kind and the kind of the make. Comparatively the small graduations of the profitable of the production admit maximally to bring near the capacities after the processing instep wastes in the powder to the sources of the formation these wastes. It is possible to realize the processing on the enterprises for metalworking, and to remove entirely the losses of the transportation storage, as well as also the expenses and losses from the corrosion. 1500kWh/t put the energy utilization on the available powders of the mechanical comminution of the instep wastes, including the tied up operations, and on the available form 4000-6000kWh/t. together [3-5]. The examinations have shown that between friction and wear a causal connection exists. If the grease thick is not sufficient to kick two contact areas entirely of each other, wear appears.

Many construction units and partial group of the different autos and machines functions taking into account the intense friction. With the industry applied wear-resistance of materials differs after their chemical composition. As an example iron graphite, iron cast iron, iron cast iron chrome, iron can show glass, hard metal etc. Iron graphite and iron cast iron are widely usable a little bit. With the method powder metallurgy very different form and size produces the gearwheels without additional mechanical metalworking. They manufacture to themselves from iron graphite, iron brass, mixture powder iron, and cast iron, alloying powders [6, 7]. Wear-resistance construction materials are processed in the institute of problem of the metallurgy academy of the sciences the Ukraine. On account of the creation such materials fixed essential working hypothesis is birth of the clear distinct uneven structures. This corresponds to Sharpmethode for warehouse materials (anti-friction material). With the use of this method wear-resistance materials system "iron cast iron chrome" [8, 9] with 25% of powder cast iron and 3% of chrome (Ch30) was treated. Therefore, the treatment of the composition materials is on account of wastes of special interest.

THE MATERIALS AND EXAMINATION METHODOLOGY

With the examinations were used the following materials:

- the reduced iron powder of a brand PJRV 2. 200.26 (GOST 9849-86)
- the (Zerstäubere) distributed brass powders of L-63 (TB-48 AzSSR 16-82)
- the powder from the special cast iron with interdendritische point graphite (TB-16-581-007-80)
- the instep wastes of production of the comminution in ball mill
- the sebum powder (GOST 19284-79)
- the technical sulfur powder (GOST 127-76E).

The special instep cast iron with interdendritic point graphite exists of the following elements in per cent (%): C 2,0-3.0; Si 2,5-3.8; ms 0,4-0.9; P 0,1-0.3; S 0,0,5-0.1. The mixture was executed in Y-mixing machine in the form within 1 hour. 400÷1000MPA has been pressed on specialized powder metallurgy for press by a type HRS-100S under the pressure the layer in compression mould with "sweating" cut plate [10, 12]. The available compact in prismatic attempt piece (sample) on degree 55·10·10mm became in run stove "KOYO-LINDBERG" sintered which can be 1 hour(lesson) on the surroundings warmth-using (Endothermic) gas in temperature

1150·1200°C with preservation time (on the same temperature) in the sintering area. The tribology qualities of the sample are examined in a friction test bench SMTSCH-2 after GOST 22502-74. The close and the porous ness of the sintered patterns were determined with Hydrostatics procedures after GOST in 1898-73. Metallography analysis was executed on the light microscope (Leica DMLM) and in the scanning electron microscope (REM).

RESULTS OF THE RESEARCHS

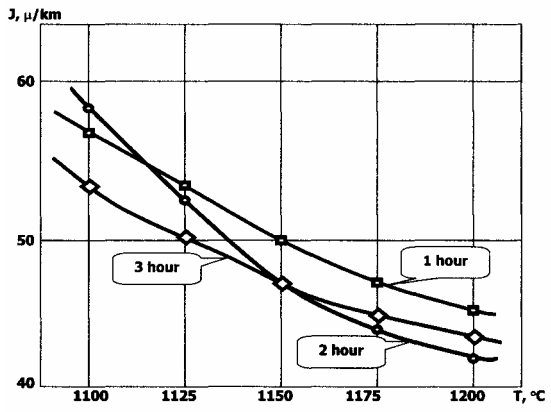
It is known [11] that the Principe of the creation is the followers for the wear-resistant powder materials:

- under the influence of the surroundings in the material the structural changes, deteriorations of the characteristic of the shelf life and plasticity should not appear,
- in the component of the material it is recommendable to work the materials, as firm smearing are capable to introduce,
- the coefficient of friction should be minimal after the material of the stencil.

The enumerated demands are realized while getting the material by the methods powder metallurgy comparatively lightly.

The executed examinations have shown that the best antifriction qualities of the material containing, are observed in degree - %: 54.5 cast irons; 10 brasses of the powder, 1.5 sebum powder and 0.5 powders of the sulfur. In the center of tribology examinations the friction and wear behaviour stands more differently, itself relatively to each other of moving surfaces. As a tribology characteristic the friction and wear behavior no constant size, but in dependence of a lot of factors is to be seen which are defeated for the lifespan of a building group partly by big fluctuations.

Tests of samples in conditions of dry friction have shown, that rise in temperature and sinter time results formation of sulfides of zinc and iron. It promotes reduction of deterioration of samples (Fig.1).



Sinter temperature, °C

Fig.1.
The dependence of the wear "iron-cast iron-brass" of the sinter temperature. Sinter time: 1-1hour; 2-2hours; 3-3hours.

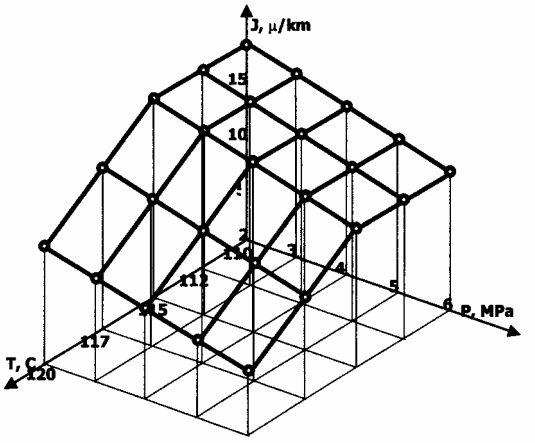


Fig. 2.
The dependence of the wear "iron-cast iron-brass" of the load and the sinter temperature (t=2,0hour, the friction with smudging).

In the component of the material it is recommendable to work the materials, as firm smearing are capable to introduce. The coefficient of friction should be minimal after the material of the stencil. The enumerated demands are realized while getting the material by the methods powder metallurgy comparatively lightly. The executed examinations have shown that the best antifriction qualities of the material containing, are observed in degree - %: 54.5 cast irons; 10 brasses of the powder, 1.5 sebum powder and 0.5 powders of the sulfur. In the center of tribology examinations the friction and wear behavior stands more differently, itself relatively to each other of moving surfaces. As a tribology characteristic the friction and wear behavior no constant size, but in dependence of a lot of factors is to be seen which are defeated for the lifespan of a building group partly by big fluctuations.

It’s very essential lowering is observed with the enlargement of the load of 2 up to 4MPa what is expressed progressively of the abrasive wear as a result of the low shelf life of the material. About in accordance with such principle changes on the contrary the sample wear. Mostly low wear becomes with the patterns, Sintering with the temperature 1200°C and tested under the load 2MPa observes, and the highest wear which were tried out sintering with 1100°C and under the load 6MPa (Fig. 2).

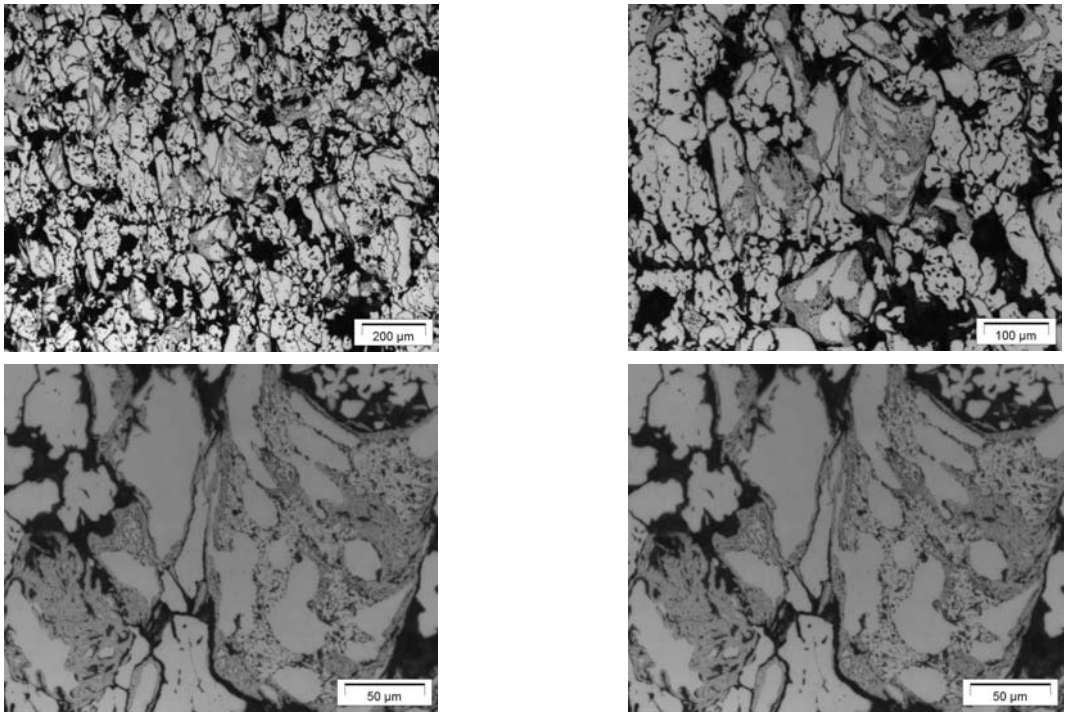


Fig.3.
The microstructure composition materials "iron-cast iron-brass".
Sinter temperature: 1150°C, sinter time 1 hour.

Mechanical and antifriction qualities of the composite material is as a function of the step of the cooperation of the components with sintering. At the same moment becomes even more any contact with the component of cast iron which is covered by the graphite, difficultly. Therefore, very weak connection becomes with Sintering between similarly, as well as the dissimilar little material part set up, and to the consequence the material with the weakened metallic rack is formed. In case of the Presses in "sweating" stencil without application of the technological greasy it is observed active drainages of the gases from the press form. Then the devastation the oxide of the engagements on the surface the deformed little material part and the rearrangement of the graphite is realized in the range compact under the pressure of the presses. And if the formation "juvenile" of

the contact " iron - iron ", the " iron - brass " and the "iron cast iron brass" particle is contributed. The sintering is accompanied such compact not so much by the homogeny and the establishment of the composition material. Therefore, such materials differ by high physically-, mechanically and anti-friction qualities. The examination of the microstructure of the sintering " iron - cast iron - brass " has shown that for all cases in the structure of the materials structure lot cementit on between particle the borders and all around pore is present.

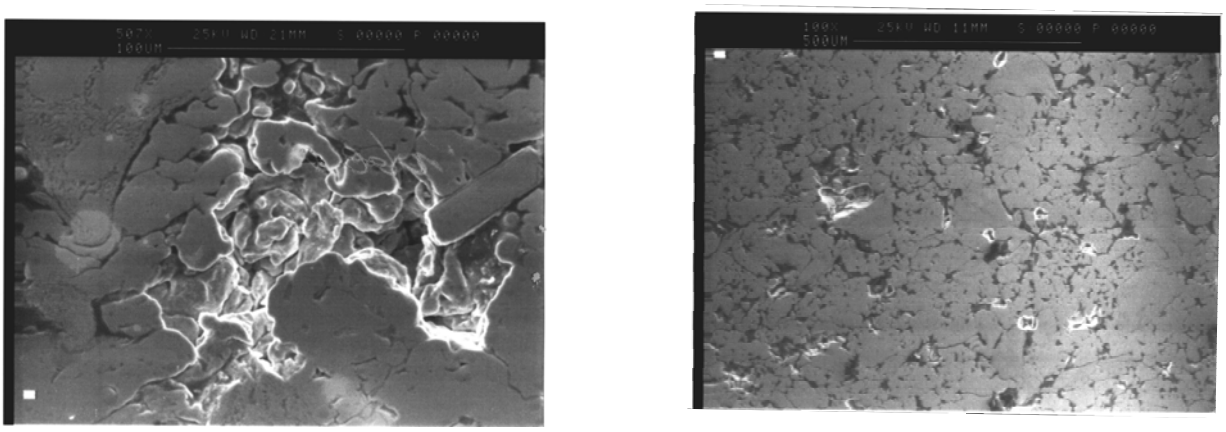


Fig.4.
REM taking the composition materials "iron-cast iron-brass".

Observe big collecting him get dark engagements which exist preferably to the graphite, the zinc and oxide of the iron (Fig.3 and Fig.4).

These engagements play the roll of the concentrates of the tension in the material, reducing its shelf life, and how the examination wear-resistance with him dry friction.

SUMMARY

1. The " iron - cast iron - brass " composition powder material has the following component which develops as a degree - %: 54.5 cast irons, 10 powder brasses, 1.5 sebum powder and 0.5 sulfur powders.
2. It is established, that at dry friction with increase of loading from 6 up to 10 MPa, intensity of wear process of the received compositions raises.
3. It has been shown that the highest mechanically and antifriction qualities the present powder compositions material are stated with the sinter temperature 1200°C what is caused with improvement of the cooperation of the dissimilar particles of the cast iron, the iron and the liquid phase of the brass.
4. Is determined that in case of the application of the technology of the cold presses in "sweating one" of the matrix of the layer, without application of the technological greasy and in the following sintering with the temperature 1200°C with the isothermal quotation in the zone sintering 1 hour on the surroundings endothermic of the gas physic mechanical and antifriction of the qualities almost in 2 paints as a result of actively drainages of the gases from the compression mould are raised.

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DƏMİR ƏSASLI ANTİFRİKSİON OVUNTU KOMPOZİSİYA MATERİALLARI

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Məqalə çuqun yonqarının tullantılarından alınmış ovuntular əsasında «dəmir-çuqun-bürünc» sistemli ovuntu kompozisiya materiallarının antifriksion xassələrinin tədqiqinə həsr edilmişdir. Müəyənləşdirilmişdir ki, «tərləyən» matrisalı pres-qəlibdə texnoloji yağlayıcılardan istifadə etmədən 1200°C temperaturda 1 saat müddətində endotermik qaz mühitində bişirməklə alınmış ovuntu materiallarının fiziki-mexaniki və antifriksion xarakteristikaları press-qəlibdən qazların xaric edilməsi hesabına təxminən 2 dəfə yüksəlir.

АНТИФРИКЦИОННЫЕ ПОРОШКОВЫЕ КОМПОЗИЦИОННЫЕ МАТЕРИАЛЫ НА ОСНОВЕ ЖЕЛЕЗА

Р. Г. ГУСЕЙНОВ, С. Н. НАМАЗОВ, М. Ч. ГУСЕЙНОВ, Т. Г. ДЖАББАРОВ

Статья посвящена изучению антифрикционных свойств "железо-чугун-латунь" на основе стружковых отходов чугуна. Установлено, что в случае применения холодного прессования в пресс-форме с "потеющей" матрицей без применения технологической смазки и с последующим спеканием при температуре 1200°С с изотермической выдержкой в зоне спекания 1 час в среде эндотермического газа физико-механические и антифрикционные свойства увеличиваются почти 2 раза в результате активного дренажирования газов от пресс-формы.

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