EXPERIMENTAL RESEARCH ON POWDER PROPERTIES RESULTING IN BEARING RECTIFYING

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Abstract: *This paper presents some results obtained as the consequence of researches in the powder obtained by processing the bearings properties. The studied parameters values are correlated with the values of the same specific parameters of other powders, produced by other methods.*

Keywords: *powder, steel, bearing, rectifying, properties.*

1. INTRODUCTION

The metallic powders and the products which are make from these are useful for a large scale in machine building industry, in aeronautical industry, electrotechnics, chemistry industry and other domains [1,3,4].

The metallic powders are useful either in pure stage (the initial stage) or in mixture of different composition depending on the characteristics of the sintered product.

As a result of processing the bearings, a large quantity of sludge is collected. This sludge obtained by rectifying process contains mostly steel powder. Besides this steel powder, it can be found also small mineral particles of grinding stone.

This paper presents the results obtained as consequence of researches regarding this powder, which have the purpose of establish a procedure for recycling this powder

2. POWDER OBTAINIG

The studied powder is obtained by the rectifying process the bearings. The sludge resulted here contains, besides basic powder, impurities like:

- rectifying stone particles – by major rectifying they exists in a proportion of 14-16%, and by fine rectifying they can be found in a proportion of 10-12%;
- binder particles from the rectifying stone;
- oil and water from the stone and object cooling emulsion.

The granules of this powder are plasticity deformed, because the hard particles of the rectifying stone are splinting the object with major distinct angles [2].

The powder is, sometime, rosted on its surface because of the high temperature produced in the moment of splinter detachment from the rectified object.

For the research purpose, the sludge was processed this way:

1. Drying: was made both in laboratory ovens and simply, in atmosphere;
2. Softening bakeing and/or softening reducement: was made with the purpose of softening the slinter and rejecting the oxids formed at the object surface; there was applied a thermic treatments, with cyclograme presented in figure 1.

All our performed researches have shown us that the controlled atmosphere, high temperature and maintenance time lead to power reduction an softening (initially, the granules dad a extreme high hardness: 350…500 HV).

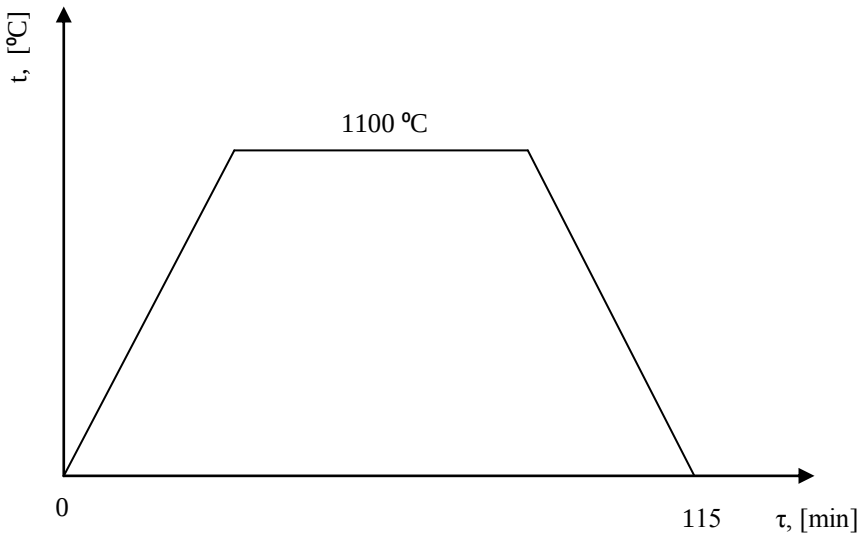

FIG. 1. Thermic treatment's cyclograme

3. Powder enrichment by magnetic separation: by separation can be partially reject the impurities, but still there remain 1…2% of them.

Mention: during the researches it was used both enriched and not enriched powder.

3. CHARACTERIZATION OF POWDER

Taking and preparationing the evidences for the determination of the metallic powders properties must be assure a real representation of the lot and this is fulfil in keeping with STAS.

The attempt's results can be more and more better if you take the next aspects into account:

- to decrease to minimum the possibility influence of the possible segregation;
- to avoid the oxidation;
- to avoid the growth of humidity.

If the evidence must be keep with a view determination of theire characteristic, the keep must be make in a way what guarantees the initial stale of the powders.

The evidences what make the object of this investigations have processed of the powder, result from the processing of bearings. This powder has been washed for the removing of the oils and the other impurities which appear at the cooling of the parts and the tools of the mechanics processing [1,5].

The physics property which made the object of this investigations were:

1. *the granule's form;*
2. *the border structure of the granules;*
3. *the granule's micro hardness;*
4. *the size of the granules and their granulometrichal repartition.*

1. ***The granule's form*** in general is determinate in the process of the manufacture of the powder, but, it can be modificate (improvement) afterwards with different proper treatments. The powders can have spherical granules, ovoide, lamellar, acicular, lensical etc.

The investigate powder was looked at many type of microscope: biological, metallographic, stereoscopic. In all this case it has been used the size 100X. The granules of this powder have an acicular form (in general), but there are lensical and lamellare form too.

Because of the rectifying method, the powder granules haven't the same size and shape; some of the blades are longer, other are bended.

From the quantitative point of view, the granule shape is expressed by using the shape coefficient: ***n*** (length coefficient) and ***m*** (breadth coefficient).

For the studied powder the coefficient is medium – sized: ***n/m = 0.188/0.055 = 3.4***

2. ***The border structure of the granules*** can be dense or porous spongy. For the resultant powder from the process of bearings the border structure is determinate with the metallographic microscope help.

The powder have included in a synthetic resin (plastics) after this, the evidences which have been obtaining have been polished and attacked with a metallographic reagent. At the and of these operations have ascertained that the granules of this powder have a complet structure, but it have been observed too porous spongy granules with traces of oxide.

3. ***The granule's micro hardness*** are dependent on the chemical composition of the powder's material and on the proceeding how was made the powder.

The micro hardness have been determined with the metallographic evidence which were used the determination of the boarder structure of the granules.

The investigate powder presents a big micro hardness, understandable with the way for obtain the powder.

For enlarge the duration of the press moulds and the improvement of the powder's property, is recommend a For a longer period of time, the pressure molds and the improvement of the powder's property are recommended a reducing protective atmosphere to reduce the oxide layer.

4. ***The size of the granules and their granulometrichal repartition*** present a decisive influence on the technological properties of the powder and on the properties of the products and sintered products.

The granulometrichal repartition of the result of powder from the processing of the bearings, have been determined with the analysis sifting, and using un set of sieves in accordance STAS. For this determination have used two type of powder prepared in different mood (write down 1 and 2).

The results of this analysis of sift are dates in tables number 1 and 2.

Table 1. Granulometric analysis for type 1 powder

The class of granulation, [mm]	The weight of the granulometrichal, [g]	The accumulation crossing, [%]
> 0.595	9.50	100.00
0.595 – 0.297	8.66	90.50
0.297 – 0.149	15.34	81.84
0.149 – 0.125	7.80	66.50
0.125 – 0.088	7.80	58.70
< 0.088	50.90	50.90

Table 2. Granulometric analysis for type 2 powder

The class of granulation, [mm]	The weight of the granulometrichal, [g]	The accumulation crossing, [%]
> 0.595	7.80	100.00
0.595 – 0.297	7.00	92.20
0.297 – 0.149	13.00	85.20
0.149 – 0.125	5.50	72.20
0.125 – 0.088	7.30	66.70
< 0.088	59.40	59.40

4. CONCLUSIONS

The powder which are have obtained in the mechanical processing of bearings present some important physics properties: the form and the boarder structure of the granules, the powder's fineness and the granulometrichal repartition.

These properties present an important interest in the utility of this powder for the obtaining of products with the metallurgical technologies of powder.

The utility of this powder is determinate too both way of obtain and the nature (steel of bearings) and the not negligible amount.

This investigations permit the stabilization of some technology for the powder which was obtained in the mechanics processing of the bearings.

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