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# FEATURES OF PRODUCTION AND FORMATION OF BARS HALF FINISHED PRODUCTS PROPERTIES FROM TURN OF SHAVING SCRAPE OF DOUBLE L63 BRASS

**Rogovoy A.A., Dybov N.N., Kabanov M.A.**
**Supervisor candidate of engineering sciences Zagirov N.N.**
***Siberian Federal University***

While manufacturing products and semi-finished products processed by pressure from copper and its alloys including brass in the conditions of market economy traditional approaches can be used along with and schemes, realized with serve initial raw materials such as shaving scrape which is formed at different of steel products machining. These schemes don't include melting stage the chain of main technological operations, and are based on application of some methods in the initial stage, more characteristic for processes of powder metallurgy. Besides the reliability of chemical composition and the maximum degree of purity (the minimum extent of pollution), several specific moments have to be considered at the demands to secondary raw material. Those are the type of shaving scrape and level of mechanical characteristics of separate fragments making them.

Depending on properties of a processed material, geometry of the cutting tool, and also the way and the cutting modes, shaving scrape being formed can differ in a shape, look and a structure, representing one of three main types: chipping, drain and break. According to GOST 18978-73 it can be divided into cutting chip, turning and mixed. And quite often to increase the density of preparation before compaction it is subjected mechanical crushing for the purpose of receiving smaller fraction.

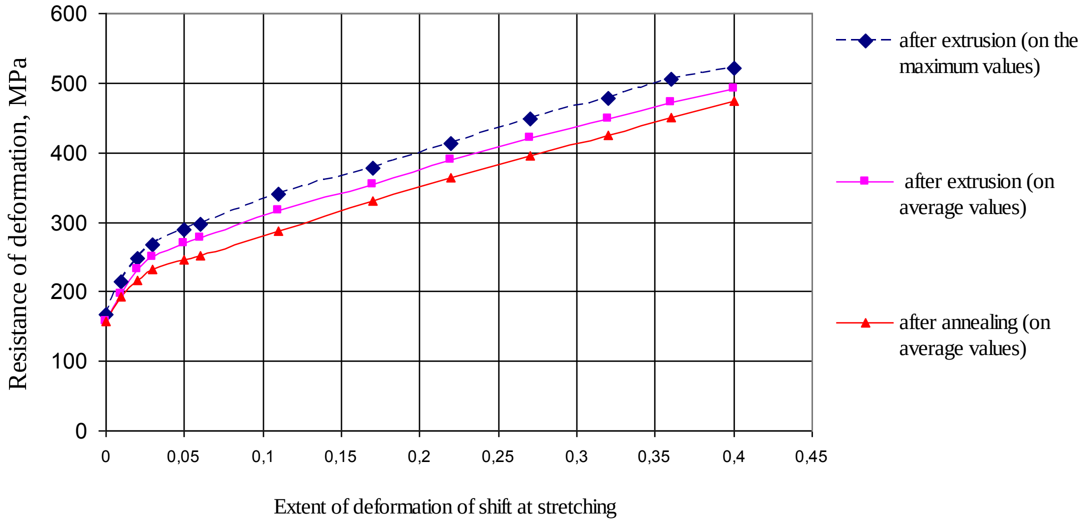
The object of the work is graded shaving scrape of one of the most widespread brands of the simple L63 brass which is formed when pressed bar is machined of the on the lathe (picture 1).

Picture 1 – Type of the bar and shaving formed after turning

Lubricant cooling liquids were not used when turning the bar on the lathe therefore such preparatory operations as degreasing, washing and drying of shaving weren't carried out. As the waste generally represented the turning that occupies a rather large volume in the course of filling in the compression mold for briquetting, it had been previously grinded in the screw crusher, and the exit fragments of shaving were almost flat, 5 – 10 mm long. The subsequent briquetting of the shaving, whose charge in each case weighed about 250 gr., was carried out in identical conditions. The compression mold was heated up to the temperature of 420 ± 10 °C. Briquetting pressure with 40 mm diameter of the container was accepted equal 200 MPas., the time under pressure corresponded to 5 min. The compacted shaving briquettes looked practically the same, 25 – 30 mm high, with the level of relative density about 93 – 95%. Further the received briquettes were heated in the separate furnace to temperature of 850 °C, transferred and placed in the tool equipment heated to temperature of 430 - 450 °C mounted on a table of the vertical hydraulic press by effort 1 MH. Then hot extrusion of briquettes was made by a direct method through a conic matrix with receiving bars with a diameter of 8 mm (the drawing factors of μ made thus 32).

Because of quite essential difference of temperatures for heating briquettes and tool equipment, small dimensions of briquettes and not always exact observance of a time span of their transfer from the furnace to a press it is rather difficult to provide each time the certain set temperature of metal in the deformation center in the course of extrusion. Therefore some properties of the received press products can differ a little from each other depending on structural changes occurring at this or that temperature established in metal. For establishment of range of this change a little pressed on the mode of bars stated above divided into two equal parts one of which annealed at a temperature of 650 °C within 1 hour, and another left untouched in a hot-rolled condition. Further from both parts fragments of which according to GOST 1497-84 made standard samples with a ratio of the sizes of working part were selected $l_0 \times d_0 = 30 \times 5$ mm for carrying out tests for stretching of working part. Experiments made by universal electromechanical test LFM car – 400 with creation of the primary chart of stretching's, registration by its special protocol and parallel fixation of the main mechanical characteristics of a material – a conditional limit of fluidity $\sigma_{0,2}$, temporary resistance to a gap $\sigma_B$, relative lengthening δ и relative narrowing ψ. By processing of an experimental curve with use of known formulas for determination of resistance of metal of deformation $\sigma_S$ and extents of deformation of shift Λ stretching chart $P - \Delta l$ it was transformed into the dependence $\sigma_S = f(\Lambda)$, a more convenient one to be used in technological calculations. The average curves received as a result of such recalculation for five tested samples which have been separately constructed for not annealed and annealed bars, are given in figure 2.

The data displaying the nature of change in strength characteristics of metal at stretching prove the noticeable influence of temperature at which there is a process of hot extrusion on properties of a bar. If during extrusion at a speed of movement of a punch of an order $\nu = 50$ mm/sec it is possible not to leave far for the recommended temperature range of implementation of the process, making for brass L63 interval from 700 °C to 730 °C [1], that properties and behavior at stretching of a material of a hot-pressed bar are practically equal to characteristics of the same bar after carrying out annealing. The lower bound of the change interval of $\sigma_S$ in dependence of Λ in this case almost coincides with the curve constructed for the annealed bar.




Picture 2 – Dependence of deformation resistance on the extent of shift deformation at stretching samples of bars after hot extrusion and annealing

If the metal temperature during extrusion decreases notably more than the provided interval, but not below the certain limit corresponding to the most admissible level of resistance to deformation for the process on the press of a certain power (in our case effort 1 MH), the durability of the received bar will be slightly higher and will correspond better to the deformed condition of material.

In general the level of the reached mechanical properties of bars can be judged from the values of standard material characteristics such as the temporary resistance to a rupture of $\sigma_B$ and relative lengthening of $\delta$. The range of values $\sigma_B$ of hot-pressed bars makes rather wide interval from 370 to 420 MPas at change of $\delta$ from 25 to 35%. That corresponds in accordance with the 2060-2006 GOST to the condition of material from semi-firm to firm [2]. When the bars serve later as work pieces for making cold-drawn wire, it makes sense to make their annealing which guarantees at the same time decrease in strength and increase in plastic characteristics before drawing to the level that corresponds to the soft condition of material.

Literature

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