The porosity study of sintered products from electro-erosive materials of alloy Cr17, obtained in lighting kerosene

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Introduction

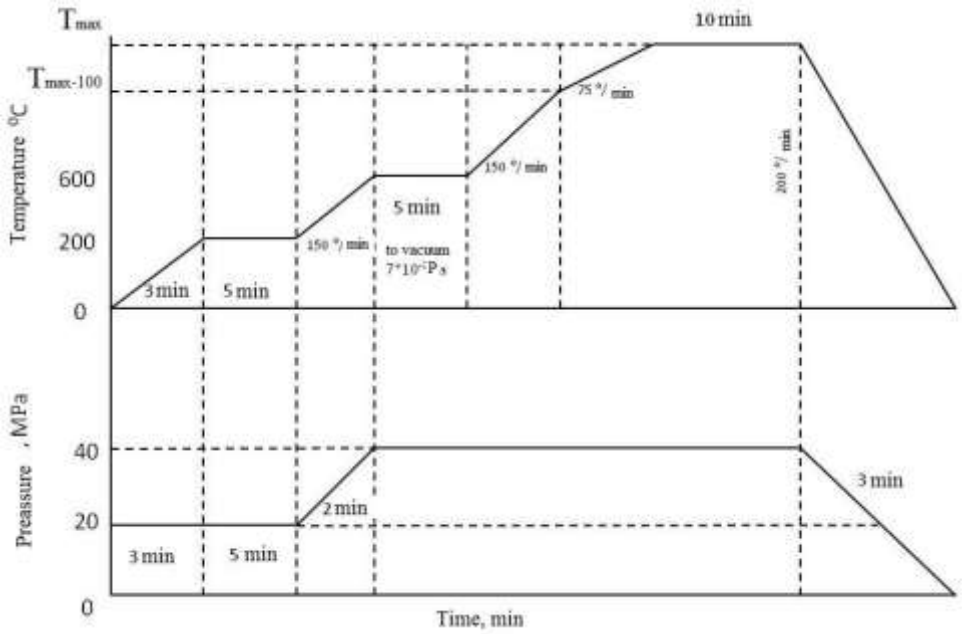
Steel Cr17 in accordance with GOST 5632-72 is defined as nickel-free, chromium heat-resistant corrosion-resistant steel of the ferrite group. In the Cr17 alloy, there is practically no nickel (less than 0,01%) and molybdenum and titanium are completely absent. But its chemical composition provides steel with resistance to corrosion in environments with moderate aggressiveness and resistance to oxidation at high temperatures. A high percentage of chromium alloy provides strength and corrosion resistance. In addition, it contributes to an increase in the melting temperature, and gives the surfaces of products gloss. And the combination of a large amount of chromium with a low carbon number increases ductility.

The widespread use of Cr17 steel in various industries leads to a large accumulation of its waste requiring processing. Currently, there are many ways to recycle metal waste in order to reuse it. However, the disadvantages of the known methods are increased energy consumption, multi-operation process [1-7].

The most promising method of processing metal waste is the method of electro-erosive dispersion (EED), which is distinguished by the ecological purity of the process and relatively low energy costs.

To develop technologies for the practical use of powder materials, obtained from waste alloy Cr17, and to evaluate the effectiveness of their use, complex theoretical and experimental studies are required. The aim of the work was to study the porosity of sintered samples from electroerosive materials of Cr17 alloy, obtained in lighting kerosene

Materials and Methods

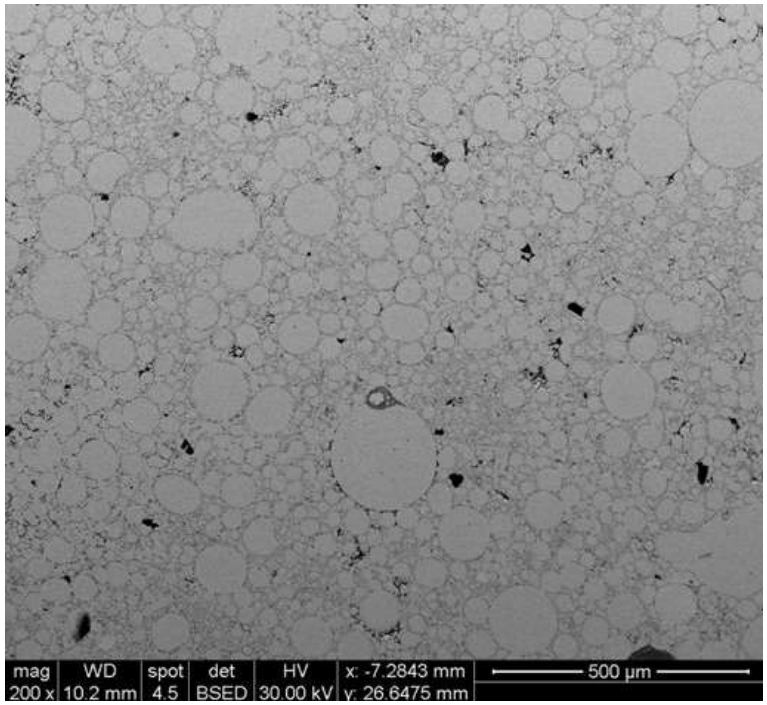


Scheme of powder consolidation by spark plasma sintering

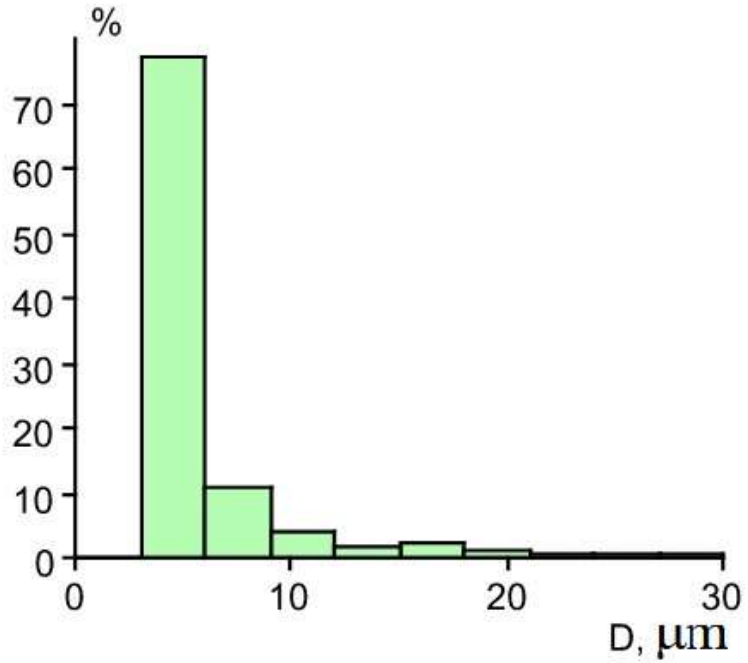
Olympus GX51 Optical Inverted Microscope

Results

Area of analysis, sq. μm	Porosity, %	D_{min}	D_{max}	D_{med}
3788639,6	0,27	3,2	27,1	4,1



The microstructure of the studied sintered sample



Pore size distribution histogram

Results

On the basis of experimental studies, aimed at studying the porosity of sintered samples by the metallographic method, it was found that when consolidating by spark plasma of sintering electro-erosive materials from Cr17 alloy wastes, obtained in lighting kerosene, the porosity was 0,27%. It is noted that more than 90% of the pores have a size of less than 10 microns. The study will determine the most relevant area of application of the obtained samples and improve the quality of scientific and technological developments.

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