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Technology for producing cast bimetal metal compositions by method of casting on gasificated models

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This research work is dedicated to solving one of the urgent problems of modern engineering - the creation of a reliable tool base. To solve this problem, the idea of creating cast bimetallic compositions (CBC) according to the insert - cast supporting base scheme [1-2] was used. The originality of the approach is, first of all, the development of a technological model of the composition formation process, the use of which allows laying the foundations of the technology for producing it at the design stage of a cast tool.

An indisputable achievement of the work is the use of the casting method for gasified models. This method compares favorably with the known methods of casting by the simplicity of technology, the completeness of the necessary equipment and the availability for existing tool shops.

The essence of the method lies in the fact that the model of the future casting is made of expanded polystyrene, then the model is molded with dry quartz sand and an integral form is formed [1-2].

Metal through the gate is poured directly into the mold with the model, under the influence of the melt, the polystyrene is gasified and the resulting cavity is filled with the melt. This feature of the method determines its merits [1-2].

A technological feature of the casting method for gasified models is the interaction between metal casting and gasification products of the model (90% carbon-containing products and 10% water). It is expressed in a certain saturation of the metal to be salted with carbon, the creation of excess pressure of volatile decomposition products of polystyrene in the cavity of the form with reducing properties, which helps to reduce the likelihood of gas shells, more smoothly fill the mold cavity with liquid metal, and eliminate oxide films on the surface of castings.

An important feature of this method is the use of a non-recoverable model, which determines the absence of need for special molding mixtures and the creation of a reducing atmosphere in the mold cavity for the entire crystallization period of castings [1-2]. This makes the casting method for gasified models very promising for obtaining bimetallic castings of high accuracy.

The finished tool is a combination of various materials, so the requirements do not apply separately to any material, for example, the working fluid of the composite, but to their combination in the compositions. Given this, it is necessary, first of all, to determine the number of possible options for the interaction of CBC components obtained by casting using gasified models.

In order to develop and implement CBC for various purposes, it is necessary to design and manufacture tooling that differs from the well-known foundry and other technologies. The technology for producing cast bimetallic tools by this method is described in the works. It should be noted that in the receiving operation there are a number of differences, reflecting the originality of the process and increasing the operability, reliability and durability of various types of CBC.

Given the results of the analysis of the manufacture of CBC, a sequence of the following basic technological methods was developed:

- preparation of polystyrene foam for the manufacture of foam models;
- manufacture of foam model tools;
- preparation of the work item;
- preparation of casting;
- receiving a casting tool.

Foam models were obtained from pre-foamed granular polystyrene. Thus, the obtained ПСВЛ-0.315 polystyrene underwent preliminary foaming in a water or steam bath for 4...6 min, followed by drying in a stream of warm air (30 ... 40°C).

Expanded polystyrene, pre-foamed, granular, was loaded into the mold, finally foamed in the autoclave of the installation for the manufacture of models.

Technological equipment for producing a foam model - a mold - was made of aluminum alloys [1-2].

Currently, the scientific and technological foundations for producing bimetallic castings of increased accuracy and wear resistance of cast bimetallic compositions for the manufacture of various types of metalworking and tillage tools, various working bodies, as well as for the repair of parts, the development of which is one of the tasks to be solved, have not been fully developed. In that work.

Thus, the analysis of technological methods for increasing the wear resistance of parts and tools operating under conditions of intensive wear showed that bimetallic and surface-alloyed castings have indisputable advantages in comparison with other methods according to the final results. In addition, both methods are technologically simpler and more cost-effective. The use of bimetallic and surface-alloyed castings necessitates the development of scientific and methodological foundations for producing multilayer layered compositions by casting in order to increase the wear resistance of the mating surfaces of parts and tools.

Studies of the structure and properties of the transition zone of the composition revealed the main laws of the formation of compositions between the main group instrumental materials and foundry structural steels. In conjunction with a wide range of tests that simulate and reproduce the working conditions of metalworking, drilling and tillage tools, the obtained patterns expanded and filled out the idea of the mechanism of formation of a reliable connection between the elements of compositions.

The developed technology for the production of cast metal layered tools and the heat treatment mode, aimed at revealing the potential of the composition, has been introduced with a significant economic effect at the engineering enterprises of the republic.

It should be noted the high efficiency of the developments presented in the work for energy and resource conservation in the production of metalworking, drilling and tillage tools of a wide range.

In general, this research work is a solution to an important scientific problem of great national economic importance.

Literature

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