DIBROV ANDREY IVANOVICH (on the occasion of his 45th birthday)

1. **M.V. Baranov, R.K. Mysik, S.V. Brusnitsyn, A.V. Sulitsin.** Modifi cation of aluminium by master alloy Al—5Ti—1B.

This article is devoted to inoculation of melted aluminum by Al—5Ti—1B used as an alloying addition.
It was studied how the structure of alloying addition influences on the aluminum macro and microstructure. It was determined the microstructure of the alloying addition depend on the melt cooling rate. The cooling rate has effect on the TiAl3 particles dimension and morphology. It was ascertained the most effect of inoculation is the case when the TiAl3 particles have equiaxial shape. The average cross-section area of TiB2 particles in the alloying Al—5Ti—1B addition is varied slightly in the range from 0.26 to 0.46 µm, whereas the average cross-section area of TiAl3 is varied significant from 40 to 250 µm. Moreover, when the combined casting and rolling process is used it is desirable to apply a rod alloying addition.

Key words: aluminum, melt, inoculation, Al—5Ti—1B addition, macrostructure, mechanical properties.

2. **A.Y. Petrov, S.N. Trubkina, V.I. Gilev, S.S. Vetryukh, M.V. Ovchinnikov.** Universal silica-based binders on a water basis.

Binders are the basis for the production of ceramic molds and the production of castings during the production of parts by investment casting. The article presents the results of testing new domestic silica-based binders at machine-building enterprise, as well as a comparative analysis of the technological properties of domestic binders and foreign ones for the production of ceramic molds for the manufacture of castings has been carried out.

Key words: water-based binders, silica-based binders, investment casting, ceramic mold, casting, investment casting.

3. **K.N. Vdovin, K.G. Pivovarova, T.B. Ponamareva, N.A. Feoktistov.** Improved parting composition of zircon paint for steel casting.

In the presented work the results of the study of new anti-stick paint on the basis of composite filler consisting of zircon and calcined kaolinite clay in the ratio 2:1. It is shown that the use of this clay as a mineral binder in the foundry composition of the aqueous paint significantly reduces its price. Selecting the ratio of the kaolinite clay as a refractory and binder required to maintain the balance between sediment stability and density of the paint.
The proposed composition of the paint with the addition of clay at the technical and operational characteristics is at the same level of properties used at zircon paint in Mechanical Repair Complex Ltd.

Key words: filler, nonstick paint of zircon, zircon, kaolinite clay.

4. **V.A. Smolko, A.V. Irshin.** Synergetics of the process of formation of molds and cores

The article considers the possibility of considering the physicochemical processes taking place in the formation of the structure and strength of synthetic sandyclay mixtures from the position of the thermodynamics of nonequilibrium processes. It is determined that according to modern concepts, the deformation and destruction of forms and cores from synthetic mixtures of any composition, should be considered as a multistage and multi-level process for a system that is far from equilibrium, taking into account the effects of self-organization.

Key words: synergetics, thermodynamics of nonequilibrium processes, synthetic sand-clay mixtures.

5. **M.A. Ivanov.** Method for determination of castings crack resistance

The article presents the method of determination of castings crack resistance at the example of constructions with two portions of various thickness taking into account the crack resistance of the alloy.
The cracks formation in such a casting happens due to the fact that the thinner part cools faster. That leads to the increase of localization of deformation because of its greater shrinkage and increasing strength. Herewith, the thick portion of the casting is still in a hot state and has a less strength.

Achievement of a balance is possible by taking into account the thickness of cross sections and lengths of portions, their cooling curves as well as the crack resistance alloy. The results are equations of coefficients of deformation localization in each portion including the consideration of the malleability of the form.

Technological solutions of crack combat are often associated with changes in the emperature—time mode of casting process and the change of the casting geometry.

This article considers the case of searching a new cooling curve for portions under unchangeable geometrical parameters and temperatures either of the first or of the second portion. The solution of the task is a third-power expression which result is an interval of cooling temperature values in dependence with the crack resistance of alloy. The greater crack resistance of the alloy is the greater interval of cooling curves temperatures is allowed to reduce the deformation localization in portions.

An algorithm of determination the quantitative assessment of casting crack resistance and the most dangerous temperature interval of alloy cooling are developed.

Key words: crack resistance, casting, localization of deformation, cracks.

6. **P.A. Sluzov, V.A. Korovin, S.V. Belyaev.** Investigation of the infl uence of calcium, barium and strontium carbonates on the change in the structure of gray cast iron.

The article presents the results of the investigation of the influence of the L-CAST_20.01 modifier on the formation of the microstructure of gray cast iron. Variants of modifying and refining the melts of grey cast irons, which contribute to improvement of mechanical properties of castings, are presented.

Key words: microstructure, L-CAST_20.01 modifier, induction furnace, refining-modifying treatment, the melt.

7. **V.A. Smolko, E.G. Antoshkina.** Fractal dimension and permeability to gas of synthetic molding and core compounds.

The article considers permeability to gas of synthetic sand mixtures. It is determined that the fractal approach can be used as a means of studying porous materials.

The program has been developed that allows to determine the fractal dimension of the fillers of synthetic molding and core mixtures, as well as the fractal dimension D of the surface of the pore space of the mold or core. The correlations obtained between the permeability to gas K and the parameter D indicate that the microstructure, whose parameter is the fractal dimension of the pore space surface, has a dominant effect on the permeability of the porous surface of the mold (core).

Key words: permeability to gas, fractal dimension, surface.

8. **R.B. Bakirov, I.E. Illarionov.** Development and introduction of ferrophosphate cold-convertible mixtures based on materials of the Republic of Kazakhstan.

The problems of using ferrophosphate cold-hardening mixtures in the process of obtaining castings with application of materials of the Republic of Kazakhstan are considered. The prospects, economic and ecological expediency of transferring technologies for obtaining castings from various alloys to ferro-phosphate coldhardening mixtures are shown.

Key words: ferro-phosphate cold-hardening mixtures, castings, materials of the Republic of Kazakhstan, strength, ecological compatibility, prime cost, surface quality of castings.

9. **S.S. Tkachenko, V.O. Emelyanov, K.V. Martynov.** Complex automation of foundry processes.

The article presents schemes for automation of a foundry based on a network solution and cloud computing. The concept of a virtual production model based on cyber-physical systems is considered.

Key words: complex automation, foundry processes, cloud computing, network solutions.