

History of the Department «Foundry hardening technology» at Ural Federal University

Citizen, teacher, scientist

1. **G.L. Khazan** About the contribution of Yu.P. Poruchikov in the theory and practice of automation of molding sands production processes.

The article proposes a unified approach to designing schemes for automatic control of molding sands production processes. It was shown that it is necessary to take into account the relationship between properties of the molding sand, the regime of its preparation and properties of its components.

Keywords: molding sand, technological properties, molding sand production, automation.

2. **R.K. Mysik, A.V. Sulitsin, S.V. Brusnitsyn, V.V. Morgunov** The technology of production of the contact wire for high-speed railways.

The article presents an analysis of possible technological schemes for the production of contact wire for railways. It has been shown that the most rational technology for the manufacture of contact wire for high-speed rail lines from low-alloyed copper alloys is a technology that includes the production of continuously cast billets of small cross-section with subsequent plastic deformation by the Conform technology and cold drawing of the extruded billet. The results of the experiments showed that this technology provides contact wire from alloys of the Cu—Mg system that meets the requirements of regulatory documentation.

Keywords: continuous casting, crystallizer, cast billet, continuous extrusion, drawing, contact wire.

3. **V.M. Karpov, V.L. Popov** The study of crystallization ability of stone melts.

A method for increasing the crystallization ability of silicate melts when they are cooled at a practically acceptable rate under production conditions other than equilibrium is considered. It has been established that the addition of finely divided chromium ore in the amount of 1...3% to the charge of glandblendite stone melts is acceptable. This allows recrystallization of the parts of castings vitrified during cooling, which guarantees high performance properties of the products.

Keywords: silicate melts, crystallization, structure, modification, stone casting.

4. **I.V. Bakhteev, R.M. Valiev, E. Yu. Slukin, V.D. Alekseev, S.M. Nikiforova** A new approach to correction of casting defects by laser refl ow.

Experimental work has been Carried out to improve the process of manufacturing ring blanks from alloys with reduced tclr with the inclusion of forging and subsequent laser healing of defects formed on the billet during plastic processing. The developed technology will allow you to get products with the required level of consumer properties at significantly lower costs for their production.

Keywords: ring casting from an alloy with a reduced tclr, rolling on a hammer of free forging, mechanical processing, welding of defects, laser installation, study of the structure.

5. **D.A. Kotov** Application of a composite model-core tooling based on epoxy resin

The article discusses the advantages of a composite model-core tooling based on epoxy resin in comparison with a wooden tooling. Examples of the successful use of composite tooling for the manufacture of castings in compressor and turbocompressor engineering are given.

Keywords: model-core tooling, epoxy resin, composite tooling, model, core box, casting.

6. **Yu.N. Loginov, S.I. Stepanov, S.V. Belikov, A.I. Golodnov, G. Zh. Mukanov, S.K. Grekhov**
Additive technologies for cellular metal structures and digitalization elements of their design.

The connection between the introduction of new technology based on the additive processes of metallurgy and mechanical engineering and the digital design technologies of cellular structures is shown. Examples of calculations are given. It is noted that in relation to the testing of cellular media obtained by the additive method, it is necessary to take into account the direction of the loads, which leads to the need to create anisotropic materials. When designing cellular media in the form of a combination of nodes and connections, it is necessary to take into account the possible concentration of stresses and, if possible, smooth out sharp transitions in such combinations.

Keywords: additive technologies, 3D printing, strength calculations, equivalent stresses, anisotropy of properties

7. **M.A. Filippov, V.A. Sharapova, V.P. Shveikin, S.M. Nikiforova, G.N. Plotnikov, S. Kh. Estemirova**
Chrome cast irons wear resistance improving by heat treatment.

The maximum abrasive wear resistance is provided by metal base from metastable retain austenite and martensite. Such a microstructure of chromium cast irons, 260Kh16M2 and 250Kh25MFT with different types of carbides — Cr₇C₃ and Cr₂₃C₆, is created by hightemperature quenching with heating to temperatures of 1125—1170 °C and cooling in oil or air. Austenite is transformed to disperse martensite on the working surface as a result of the abrasive particles impact during operation. It and carbides provide a high hardening level and working capacity of the cast irons secondary microstructure.

Keywords: abrasive wear resistance, hardening, wear resistance, martensite, retain austenite, carbides.

8. **K.V. Bulatov, V.P. Zhukov**
Mathematical modeling of kinetic of copper melt deoxidation by carbon.

In relation to the recovery stage of fire refining of blister copper, a mathematical description of the various stages of kinetic of copper deoxidation by charcoal is carried out. It is shown that the speed of the process is controlled by the mass transfer of carbon in the melt volume and the metal oxygen is reduced according to a two-stage scheme. To intensify the deoxidation of copper, it was deemed advisable to blow finely dispersed coal directly into the volume of a liquid metal with an inert or natural gas.

Keywords: carbon, deoxidation, mass transfer, nonstationary diffusion, anode melting.