

**Kosnikov G.A.** To the 80th anniversary of the Department of Physics and Chemistry of casting alloys and processes of Saint Petersburg State Polytechnical University (SPbSTU)

A summary of the history of the department and its development over the past 10 years is provided.

**Key words:** the department, Saint Petersburg State Polytechnical University (SPbSTU).

**Kosnikov G.A., Morozova L.M.** Cast irons with spheroidal and vermicular graphite

The studies of the effect of metallurgical and technological factors on the structure and mechanical properties of high strength ADI and cast irons with vermicular graphite at -60...+525<sup>0</sup>C were conducted. The technology was developed and experimental batches of gears and crankshaft blanks from ADI and fittings from cast irons with vermicular graphite were obtained.

**Key words:** austempered Ductile Iron (ADI); spheroidal, vermicular graphite; structure, properties, modifying, alloying, heat treatment, gears, crankshaft blanks, fittings.

**Kosnikov G.A., Morozova L.M.** Aluminum cast irons

The influence of chemical composition, modification, alloying and the cooling rate on structure, mechanical properties and corrosion resistance in different kinds of petroleum environments of graphitized low-aluminum (GLA) with flake and vermicular graphite and high- aluminum (GHA) with spheroidal graphite cast irons was studied. GLA ensures lack of chilling in thin sections of the castings, exceeds cerium-boron grey cast iron in corrosion resistance. GHA is cheaper than Ni-Cu cast iron (“nirezist”) and has equal corrosion resistance. The technology was developed and experimental batches of plunged pumps details at petroleum extraction were obtained.

**Key words:** low-aluminum, high- aluminum cast iron; chemical composition, modifying, alloying, cooling rate, structure, properties; flake, vermicular, spheroidal graphite; corrosion stability, castings, work details, plunged pumps

**Golod V. M., Savelev K.D.** Theory, computer analysis and modeling of casting processes

A review of works performed at the department during the period of 2000-2010 was presented in the following areas: theory and computer analysis of casting processes, thermodynamic modeling of phase transformations and phase diagrams with formation of metastable phases, evolution of dendritic structures in nonequilibrium solidification of iron- and aluminum-based casting alloys, dataware of computer-aided design of foundry technology and methods of their adaptation to the production, use of computer technologies in educational process.

**Key words:** thermodynamics of phase transformations, nonequilibrium crystallization, iron- and aluminum-based alloys, dataware, computer-aided designing, foundry technology, adaptation of computer models.

**Matveev I.A.** Prediction of shrinkage deformation of steel castings during cooling

The models and methods that allow for more accurate assignment of allowances for machining and the value of the casting shrinkage of steel castings depending on the complex developed classifications were developed.

**Key words:** steel, castings, stamps, codes, base, size, raw data, rheology, model of stress-strain state, shrinkage, temperature, foundry mould, core

**Kosnikov G.A.** Pouring cast iron for baked anodes

Chemical composition and modifying technology of the pouring cast iron with vermicular graphite for baked electrolysis anodes, ensured heightened fluidity, minimum shrinkage, sufficient strength, reduced specific resistance, conditions for directional solidification, substantial over fall of tension in system “anode-stubs”, were developed.

**Key words:** pouring cast iron, vermicular graphite, chemical composition, modifying, fluidity, shrinkage, strength, specific resistance, directional solidification, steel stub, cast iron ring, graphite baked anode, tension.

**Morozova L.M.** High-strong cast iron for high-speed carriage magneto-railway brakes

Chemical composition of ductile cast iron (DCI), technology, heat treatment mode for magneto-railway brakes (MRB) poles were developed. DCI excels standard cast iron in magnetic properties and steel in friction properties and inclination to adhering. MRB with poles from worked out DCI were installed at high-speed trains.

**Key words:** ductile cast iron, chemical composition, technology, heat treatment mode, steel, pole, magneto-railway brake; magnetic, friction properties; adhering, rails, high-speed trains.

**Olsen S.O., Skaland T., Hartung C.**

Inoculation of grey and high-duty cast iron. The graphite crystallization centers comparison and some practical recommendations of inoculation.

There are reviewed some aspects connected with inoculation of foundry cast irons.

Is revised the important features of foundry cast iron production. On the examples of microstructures and mechanical properties it is shown the difference between inoculated and not inoculated cast irons. Is described the graphitizing inoculation processes and process of graphite inclusions forming inside the grey and high duty cast irons. The data was received by investigation of inclusions which are acting the part of heterogeneous centers of graphite formation, with electron-microscope investigation method.

It is given the explanation of following alloying elements influence: calcium, barium, strontium and aluminum on the graphite inclusions formation process and also the decisive part of oxygen and sulfur in this process [1]. It is given the description of “aging” process of inoculating effect and given some practical recommendation for providing the optimal and replicable graphitizing inoculation process.

**Key words:** inoculation, gray and high duty cast iron, alloying element.

**Sulitsin A.V., Mysik R.K., Golodnov A.I., Brusnitsyn S.V.** Mechanism of vibration influence on structure and properties ingots of cadmium bronze.

In this article mechanism of vibration influence on crystallizing melt of cadmium bronze is considered. In the course of research was determined that vibration treatment of crystallizing melt of cadmium bronze leads to formation of the new centers of crystallization at the expense of destruction of already existing crystals.

**Key words:** vibration, cadmium bronze, semicontinuous casting.

**Korotchenko A.Y., Zarubin A.M.** The ways of high-pressure die castings strength and hermeticity increasing

On improving the quality of castings in injection molding by optimizing the supply castings (premolding) during solidification. 3D modeling process.

**Key words:** injection molding, modeling.

**Yurasov V. V., Silchenko T.S., Kidalov N. A.** The development of sodium silicate binder for foundry mixtures made of nanodispersed by shock wave compression treatment sodium alkaline silicate.

In this article a new method of production of the binder from liquid glass for foundry mixes is propounded; regularities and features of the process of producing the liquid glass from the nanoscale alkaline sodium silicates after shock-wave treatment are shown; a mechanism of increasing the strength of mixtures on the binder, which is proposed, is explained; it is experimentally proved that there is an opportunity of improving the process of punching out the mixes from the foundry forms by reducing the quantity of the proposed binder in the mixes without lowering its strength properties.

**Key words:** binder from liquid glass, process of punching out the mixes, shock-wave treatment, nanoscale alkaline sodium silicates, time of dissolution, nonautoclave method, films of the binder, cuff, thermal drying, ester hardener.

**L.I. Leushina, A.V. Nischenkov, A.Yu. Subbotin** Progressive technology of firing shell molds for precision steel casting

This paper presents innovative technical solutions to the problem of increasing the energy efficiency of the precision casting department at the metallurgical facilities of Arzamas Instrument Manufacturing Plant Co. Suggested is the energy-saving firing technology for multi-layer shell molds to produce critical steel castings, which has successfully passed industrial testing within the operating facilities.

**Key words:** investment casting, a casting, firing, multi-layer shell molds, grain material of parting powder, oxygen-bearing substance.