Igor Olegovich Leushin (on the 60th anniversary of his birth)

September 14, 2023 marks 60 years since birthday of a famous Russian scientist to a new foundry worker who enjoys a well-deserved significant authority both in the Russian university community, and among producers, Dear colleague and friend Igor Olegovich Leushin.

Russian Association of Foundry Workers, Editorial Board of the magazine "Foundry Worker of Russia", numerous colleagues, friends, students cordially congratulate Igor Olegovich on his anniversary and wish you good health, happiness, prosperity and further creative success in scientific, industrial and social work.

1. **M.N. Saubanov, I.O. Leushin, I.E. Illarionov.** Features of manufacturing titanium castings in graphite molds

Annotation. Graphite and petroleum coke powders are inert to molten titanium. That is why they are used for manufacturing of heat-resistant casting molds. Calcination of graphite molds used for titanium casting process is required by the manufacturing method and is a matter of special study. The optimal compositions of graphite mixtures and types of binder materials that provide the required strength, shrinkage, and gas emission of casting molds have been determined. The physical and mechanical properties of graphite mixtures have been studied by varying the amount of binder materials, calcining temperature of casting molds, size distribution and by modifying of surfaceactive agents. Increasing the viscosity of the disperse system and the strength of the graphite mixture by adding graphite micro particles stabilizes the manufacturing process and eliminates the deformation of massive molds due to gravity. The total gas emission of graphite molds under conditions of high-temperature contact with the titanium alloy in vacuum is determined by the processes of mixture components evaporation, release of gaseous products and moisture, release of gaseous products of chemical reactions and binder materials decomposition products such as carbonates and resins. The complex composition of the binder material ensures consistent hardening of the graphite mold during the manufacturing procedures of mixture compaction and calcination. Using the method of isostatic wetting of graphite substrates with a drop of varnish and resin, the positive role of small amounts of additives of surface-active agents in increasing of wettability of graphite particle mixtures with liquid components, increasing of green strength and molding properties of mixtures has been established. Determination of composition of gases released from heated graphite mixtures is required to explain the mechanism of binder formation and assess the fire and explosion hazard of the process. The composition of the residual gases in the mixture determines the intensity of interaction between casting molds and titanium casting. Different gas releasing properties of the molding sand at different temperatures have been revealed.
The use of dual-action binders is a common feature for mixtures based on powders of refractory oxides and graphite used in production of castings from titanium alloys. The primary binders, such as gels or polymers that provide the green strength of the molds and have

high gas releasing properties, are converted into secondary ceramic cakes or cokes with the reduced gas releasing properties during heat treatment. The latter provide the process strength of the molds.

Keywords: graphite powders, binders, compressive strength of graphite mixtures, mold calcination, gas generation, mixture shrinkage, adhesion forces, thermal expansion, binder coking.

2. **K.V. Nikitin, R.M. Biktimirov, I.Y. Timoshkin,V.N. Dyachkov.** Development of technology and production of castings from the synthesized alloy AK7ch by investment casting

Annotation. A full-cycle technology has been developed for the production of castings for a specific purpose by casting on cast models from the AK7ch alloy. It is shown that castings with chemical composition and mechanical properties that meet the requirements of regulatory documentation can be obtained from the AK7ch alloy synthesized from aluminum scrap and waste.

Keywords: silumins, investment casting, the phenomenon of structural heredity in alloys.

3. **C.S. Tkachenko, V.V. Korobeynikov.** Th e state and scientifi c and technical potential of the foundry St. Petersburg and Leningrad region

Annotation. The article discusses the main foundries of St. Petersburg and the Leningrad region, high-quality castings made of ferrous and non-ferrous alloys, equipment and related materials.

Keywords: castings, equipment, modifiers, cold-hardening mixtures, electric furnaces, frames.

4. **A.S. Eldarkhanov, A.S. Nuradinov, I.A. Nuradinov.** Eff ects of the cooling rate on the structure of high-strength aluminum alloys

Annotation. The article discusses the methodology for studying the effect of the cooling rate of aluminum alloys on the mechanical properties and microstructure of high-strength aluminum cast blanks.

Keywords: cooling rate, aluminum alloy, structure, properties.

5. **V.M. Kalaushin.** Improving the quality of alloy steel castings

Annotation. The ways of improving the quality of castings from alloy steels by modifying melts with siliconfree complex ligatures and heat treatment of prototypes are considered.

Keywords: alloy steel, modification, heat treatment,mechanical properties.

6. **Yu.N. Muravyev.** Modern domestic shaping equipment for HTS

Annotation. Domestic equipment for the manufacture of casting and rods from cold-hardening mixtures is offered.

Keywords: shape, rod, cold-hardening mixtures.

7. **V.V. Lavrenov, I.A. Matveev.** Development of a burnable model with hardening silicon carbide microparticles

Annotation. The method of casting according to burnt models is a process of manufacturing castings by freely pouring molten alloy into a single mold, the working cavity of which is obtained by burning a model made of rosin, block polystyrene, expanded polystyrene and other plastics in molds. This method is widely used in precision casting, used for the manufacture of critical parts.

Keywords: silicon carbide, layer-by-layer deposition technology, 3D printing, die casting, microparticles.

8. **A.S. Panasyugin, V.S. Niss, N.P. Masherova.** Production of pyrolytic carbon from waste of rubber-containing products for use in foundry

Annotation. The paper deals with the processing of rubbercontaining products by pyrolysis in order to obtain pyrolytic carbon, which is of practical interest for the needs of the foundry. It has been established that the process of gas phase evolution during rubber pyrolysis proceeds in the temperature range of 50—550 °C, the maximum release peaks for all detected substances are in the range of 375—500 °C, the total release is over 140 mg per kg of feedstock. It was found that the concentration and temperature of the exhaust gases make it possible to neutralize them in an autocatalytic mode using the principle of filtration combustion. It is shown that the optimal temperature for obtaining a solid carbonaceous residue (target product) is 320—380 °C, an increase in temperature above 500 °C leads to a decrease in the mass fraction of pyrolytic carbon from 64.8 to 31.9 %, respectively, the proportion of exhaust gases increases from 5 to 8 %, and heating oil yield from 30.2 to 60.1 %.

Keywords: rubber, pyrolysis, pyrocarbon, metallurgy, furnace fuel, waste gases.