

## Contents

«FOUNDRY MEN o f R U S S I A» № 11/2018

1. **V.A. Kechin.** Main stages of formation and development departments of technology of functional and construction materials.

The article presents the history of the formation and stages of development of the department «Technologies of functional and structural materials» of Vladimir State University. The directions of the level training of specialists for the foundry and metallurgical production and the scientific achievements of the staff of the department are given.

**Keywords:** Department of Technology of Functional and Structural Materials, Levels of Training, Scientific and Educational Activities.

2. **A.A. Panfilov, E.S. Prusov, V.A. Kechin.** Features of metallurgical processes at the melting of aluminum matrix compositional alloys.

The paper analyzes the metallurgical processes of phase interaction at the smelting of aluminum matrix composite alloys from the standpoint of thermodynamics and kinetics using the example of the Al—SiC system. The stages of interaction processes between matrix melts and reinforcing particles are distinguished. The features of diffusion processes and chemical reactions at interphase boundaries during smelting of composite alloys are shown.

**Keywords:** Aluminum matrix composite alloys, metallurgical processes, phase interaction.

3. **V.F. Korostelev.** Automation of process control of crystallization during casting with superimposed pressure.

Crystallization of mold pieces as the basic process defining quality and properties of end products in terms of automation of control remains — is difficult, and little studied object. The aim of research is extension of the nomenclature of alloys, including also the deformable thermally strengthened alloys, improvement of their physico-mechanical properties. It is established that in industrial alloys change of volume can reach 12...13%, at the same time increase in density can reach 2...3%. The imposing of pressure coordinated with crystallization speed considerably excludes reject on gas-shrinkable defects, eliminates manifestations of a liquation, provides fine grained structure in sections to 80 mm and more.

**Keywords:** crystallization as control of an object, imposing of pressure, inventory, control and measuring system, adaptive control, formation of properties

4. **V.D. Belov, K.H. Ngyen.** Influence of the cooling speed in crystallization of copper-phosphorus alloy on its ability to mill the primary silicon in nauvtectic silemins.

Currently, the most common modifier of hypereutectic silumin is phosphorus, which is introduced into melts in the form of ligatures copper—phosphorus (Cu—P) with a different mass fraction of phosphorus in them, or a technical copper phosphide Cu<sub>3</sub>P. The effect of fine-crystalline phosphorus-containing ligatures on the microstructure, technological and operational characteristics of hypereutectic silumin is not well understood. Therefore, the development of phosphorus-

containing ligatures of various structures that allow the reduction of primary silicon crystals in silumin is an urgent task. The 4th type of experimental master copper-phosphorus ligatures was developed at the Institute of MisiS for the modification of hypereutectic silumins. As a result of the conducted studies it was established that fine-crystalline copper-phosphorus master alloys are more efficient in grinding in them crystals of primary silicon. The use of such alloys in the technology of obtaining commercial hypereutectic silumins will significantly improve the characteristics of the latter and give the prospect of designing new alloys.

**Keywords:** Alloys, fine crystalline ligatures copperphosphorus, silumin, cooling rate.

**5. E.S. Prusov.** Development of the principles of cast metal matrix composites recycling.

It is shown that the intensive development of the global market of metal matrix composites is inextricably linked with the problem of accumulation and utilization of new types of industrial wastes, which makes urgent the development of energy-efficient, economically viable and environmentally safe technological solutions for their recycling. Modern approaches to recycling of cast metal matrix composites are analyzed and their classification is proposed. Technological factors affecting the degree of change in the properties of metal matrix composites during their processing by remelting are revealed.

**Keywords:** Cast metal matrix composites, waste recycling, interfacial interaction, principles of recycling, technological factors.

**6. V.A. Kechin, A.V. Kireev.** Evaluation of the efficiency of segregation refining aluminum melts from dissolved gases.

The possibility of evaluating the effectiveness of segregation refining of aluminum melts from dissolved gases with the introduction of titanium (zirconium, manganese) using the general principles of the theory of extraction as applied to metal melts is shown. It is shown that titanium and zirconium, when introduced into an aluminum melt, bind hydrogen into metal-like hydrides capable of reducing porosity in castings.

**Keywords:** segregation refining, aluminum, additive elements, degassing efficiency.

**7. A.I. Khristoforov, I.A. Khristoforova.** Influence of waste of metallurgical production on the properties of heat-insulating material.

The results of studies of the effect of the concentration of metallurgical waste of iron ore on the properties of thermally insulating foam aluminum silicate are presented: thermal conductivity coefficient, maximum pore diameter, density, water absorption. The macrostructure of the composite foamaluminosilicate and the microstructure in the partitions of the formed cells were studied.

**Keywords:** inorganic foam material, metallurgical waste, density, water absorption, pores, thermal conductivity coefficient.

**8. L.V. Kartonova.** Selection of the alloying elements and heat treatment modes of steel castings.

The problem of material selection for castings is discussed. The features of heat treatment of the main groups of castings are presented. Recommendations on the selection of heat treatment modes of steel castings are given.

**Keywords:** steels selection, heat treatment of castings.

**9. N.A. Elgaev.** Method of fatigue damage assessment for the cast products by changing the stiffness.

The article describes dynamic fatigue test methods in self-oscillating mode and its implementation in the proposed test system.

**Keywords:** material fatigue, assessment of fatigue damage, self-oscillating mode, residual resource.

**10. V.N. Sharshin, E.V. Sukhorukova, D.V. Sukhorukov, V.A. Kechin.** Foundry properties of tin alloys for artistic casting.

The results of studies of the basic casting properties of tin alloys are presented. The role of antimony, copper and indium in the change of fluidity, shrinkage and form filling of tin alloys is shown. The compositions of tin alloys with the best casting characteristics for the manufacture of cast products are given.

**Keywords:** casting properties, tin alloys, art casting.