



BULLETIN

OF THE SOUTH URAL
STATE UNIVERSITY
SERIES

2024

Vol. 24, no. 2

“METALLURGY”

ISSN 1990-8482 (Print)
ISSN 2411-0906 (Online)

Vestnik Yuzhno-Ural'skogo Gosudarstvennogo Universiteta.
Seriya "Metallurgiya"

South Ural State University

The journal publishes papers in the fields of physical chemistry of metallurgical systems, metal physics and physical metallurgy, heat treatment of metals and alloys, theory and technology of production processes of metals and alloys, metallurgical equipment, metal casting, metallurgical heat engineering, metal forming as well as related areas of science and technology.

Editorial Board:

Vinnik D.A., Dr. of Sci. (Chem.), South Ural State University, Chelyabinsk, Russian Federation;
Vydrin A.V. (*editor-in-chief*), Dr. of Sci. (Eng.), Prof., South Ural State University, Chelyabinsk, Russian Federation;
Kvon S.S., Cand. of Sci. (Eng.), Ass. Prof., Karaganda State Technical University, Karaganda, Republic of Kazakhstan;
Koryagin Yu.D., Dr. of Sci. (Eng.), Prof., South Ural State University, Chelyabinsk, Russian Federation;
Kulakov B.A. (*deputy editor-in-chief*), Dr. of Sci. (Eng.), Prof., South Ural State University, Chelyabinsk, Russian Federation;
Lahderanta E.M., Prof. of Physics, Lappeenranta University of Technology, Lappeenranta, Republic of Finland;
Niewa R., Dr. rer. nat., Prof., University of Stuttgart, Stuttgart, Federal Republic of Germany;
Trukhanov A.V., Cand. of Sci. (Phys. and Math.), Scientific-Practical Materials Research Centre of NAS of Belarus, Minsk, Republic of Belarus;
Shirokov V.V. (*executive secretary*), Cand. of Sci. (Eng.), South Ural State University, Chelyabinsk, Russian Federation.

Editorial Council:

Al-Khuzaie A.S.O., Cand. of Sci. (Eng.), Al Iraqia University, Baghdad, Republic of Iraq;
Belov V.D., Dr. of Sci. (Eng.), Prof., National University of Science and Technology “MISIS”, Moscow, Russian Federation;
Beskachko V.P., Dr. of Sci. (Phys. and Math.), Prof., South Ural State University, Chelyabinsk, Russian Federation;
Vdovin K.N., Dr. of Sci. (Eng.), Prof., Nosov Magnitogorsk State Technical University, Magnitogorsk, Russian Federation;
Galevskiy G.V., Dr. of Sci. (Eng.), Prof., Siberian State Industrial University, Novokuznetsk, Russian Federation;
Gol'dshteyn V.Ya., Dr. of Sci. (Eng.), South Ural State University, Chelyabinsk, Russian Federation;
Dubrovin V.K., Dr. of Sci. (Eng.), Prof., South Ural State University, Chelyabinsk, Russian Federation;
Elanskii G.N., Dr. of Sci. (Eng.), Prof., Interregional Social Organization “Association of Steelmakers”, Moscow, Russian Federation;
Zvonarev D.Yu., Cand. of Sci. (Eng.), JSC “The Russian Research Institute of the Tube and Pipe Industries”, Chelyabinsk, Russian Federation;
Znamenskii L.G., Dr. of Sci. (Eng.), Prof., South Ural State University, Chelyabinsk, Russian Federation;
Ivanov M.A., Cand. of Sci. (Eng.), Ass. Prof., South Ural State University, Chelyabinsk, Russian Federation;
Koval' G.I., Dr. of Sci. (Eng.), Prof., South Ural State University, Chelyabinsk, Russian Federation;
Kulagin N.M., Cand. of Sci. (Chem.), Prof., Siberian State Industrial University, Novokuznetsk, Russian Federation;
Lykasov A.A., Dr. of Sci. (Chem.), Prof., South Ural State University, Chelyabinsk, Russian Federation;
Mysik R.K., Dr. of Sci. (Eng.), Prof., Ural Federal University, Ekaterinburg, Russian Federation;
Naizabekov A.B., Dr. of Sci. (Eng.), Prof., Rudny Industrial Institute, Rudny, Kazakhstan;
Roshchin V.E., Dr. of Sci. (Eng.), Prof., South Ural State University, Chelyabinsk, Russian Federation;
Frage N., Prof., Ben-Gurion University of the Negev, Beer Sheba, Israel;
Khramkov E.V., Cand. of Sci. (Eng), JSC “The Russian Research Institute of the Tube and Pipe Industries”, Chelyabinsk, Russian Federation;
Chumanov I.V., Dr. of Sci. (Eng.), Prof., South Ural State University, Chelyabinsk, Russian Federation;
Shao Wenzhu, Prof., Harbin Institute of Technology, Harbin, China;
Yakovleva I.L., Dr. of Sci. (Eng.), M.N. Mikheev Institute of Metal Physics, Ural Branch, Russian Academy of Sciences, Ekaterinburg, Russian Federation.

СОДЕРЖАНИЕ

Физическая химия и физика металлургических систем

ДРОЗИН А.Д., ДУДОРОВ М.В., КУРКИНА Е.Ю., ВЯТКИН Г.П. Расчет химических потенциалов компонентов наночастиц	5
ДРОЗИН А.Д., ДУДОРОВ М.В., КОРЯГИН Ю.Д., КУРКИНА Е.Ю., ВЯТКИН Г.П. Коэффициенты активностей компонентов зародышей продуктов химических реакций в сталеплавильных процессах	13

Металловедение и термическая обработка

ФАЛАХУТДИНОВ Р.М., ПОПОВ В.В., СУДАКОВА С.А., ШОРОХОВ Е.В., ГААН К.В. Влияние динамического канально-углового прессования на относительную энергию границ зерен в гафниевой бронзе	20
--	----

Обработка металлов давлением.

Технологии и машины обработки давлением

БАТАЛОВ Г.С., ШАНДЕР С.В., ГИЗАТУЛЛИН А.Б., ШАКИРОВ Р.Д., КОТЛОВ А.О. Разработка технологии и освоение производства труб диаметром 2520 мм	29
ЗАКАРЛЮКИН С.И., КОВАЛЬ Г.И. Совершенствование технологии радиальной ковки прямоугольных профилей	41
ШАМИЛОВ А.Р., КОРОЛЬ А.В., ОБЫДЕННОВ Е.Н., АЛЕЩЕНКО А.С., ГОНЧАРУК А.В. Прокатка труб из стали марки 08Х18Н10Т на ТПА 70-270 с двухвалковым станом для прошивки и раскатки	49

Металлургическая теплотехника и теплоэнергетика

ПАНФЕРОВ В.И., ПАНФЕРОВ С.В. Об экономичном управлении нагревом металла в протяжных печах и агрегатах	61
---	----

Краткие сообщения

ХАСАНОВА Э.А., ЩЕРБАКОВ И.А., СУЛЕЙМАНОВА И.И. Получение интерметаллидного соединения Fe ₃ Al методом послойного электродугового выращивания	70
---	----

Персоналии

Памяти Геннадия Георгиевича Михайлова	73
---	----

CONTENTS

Physical chemistry and physics of metallurgical systems

DROZIN A.D., DUDOROV M.V., KURKINA E.Yu., VYATKIN G.P. Calculation of the chemical potentials of nanoparticles components	5
DROZIN A.D., DUDOROV M.V., KORYAGIN Yu.D., KURKINA E.Yu., VIATKIN G.P. The activity coefficients of the nuclei components of the chemical reactions products in steel-making processes	13

Physical metallurgy and heat treatment

FALAHUTDINOV R.M., POPOV V.V., SUDAKOVA S.A., SHOROKHOV E.V., GAAN K.V. Influence of dynamic channel-angle pressing on relative energy of grain boundaries in hafnium bronze	20
--	----

Metal forming. Technology and equipment of metal forming

BATALOV G.S., SHANDER S.V., GIZATULLIN A.B., SHAKIROV R.D., KOTLOV A.O. Development of technology and mastering the production of pipes with a diameter of 2520 mm	29
ZAKARLYUKIN S.I., KOVAL G.I. Improvement of technology for radial forging of rectangular profiles	41
SHAMILOV A.R., KOROL A.V., OBYDENNOV E.N., ALESHCHENKO A.S., GONCHARUK A.V. Rolling of pipe from steel grade 08X18H10T on a TPA 70-270 with a two-roll mill for squashing and rolling	49

Metallurgical heat and power engineering

PANFEROV V.I., PANFEROV S.V. About economical control of metal heating in broaching furnaces and units is considered	61
--	----

Brief reports

KHASANOVA E.A., SHCHERBAKOV I.A., SULEYMANOVA I.I. Production of intermetallide compound Fe ₃ Al by layer-by-layer electric arc growth method	70
--	----

Personalia

In memory of Gennadiy Georgievich Mikhaylov	73
---	----