

ABSTRACTS

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Influence of Physical and Chemical Sintering Processes on Sinter QualityYuriev B. P., Dudko V. A. // *Stal'*. 2024. No. 2. P. 2 – 8.

Large reserves of Bakal siderite ores necessitate the development and implementation of various methods for using them in metallurgical stages, both in pure form and in mixtures with other ores (for example, magnetite, brown iron ore, etc.). One of such methods of using a charge consisting of a mixture of siderite ore and brown iron ore in the production of sinter is considered. In order to optimize the sintering process, the mechanism of the main reactions occurring in the agglomeration layer has been studied. Knowing the thermal effects of these reactions, it is possible to determine the amount of heat required for the sintering process and obtain data on the consumption of solid fuel required to obtain a sinter with the required properties. The paper presents the results of studies obtained on an experimental setup. The effect on the sintering process of ore size, solid fuel consumption, layer height, ratio of siderite ore and brown iron ore content in the charge has been established. To obtain the necessary information with a minimum number of experiments, one of the methods for planning and processing experimental data was used. The results of the work indicate the possibility of using siderite ores in the metallurgical enterprises of the country.

Key words: siderite ore, brown iron ore, sintering, reactions, thermal effect, solid fuel consumption, agglomeration, experimental setup, parameters, planning method, productivity, quality, combustion zone, charge.

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Calorimetric Studies of Polymorphic Transformation of IronDavydov S. V., Spivak L. V., Shchepina N. E. // *Stal'*. 2024. No. 2. P. 9 – 24.

Iron polymorphism, as a basic phase transformation in the industrial technology of iron-carbon alloys, manifests itself in three forms in the processes of heating and cooling iron. The analysis of the literature data revealed the lack of information about the essence of the mechanism of polymorphic transformation of pure iron. In this work, the second polymorphic transformation of α -Fe \rightarrow γ -Fe was experimentally checked by the method of differential scanning calorimetry (DSC) of high resolution. The object of the study was samples of commercially pure iron wire (TZZ-99.88% Fe) and high-purity zone-purified iron (ZHZ-99.995% Fe). Heating and cooling were carried out in an atmosphere of argon (99.9995% Ar). Based on the analysis of DSC curves, the following results were obtained: the value of hysteresis of polymorphic transformation during thermal cycling is ~ 11 °C; Polymorphic transformation of iron is not reversible when heated and cooled and proceeds by different mechanisms; The existing ideas about the reversible polymorphic phase transformation of α -Fe \rightarrow γ -Fe under heating as a phase recrystallization within the framework of a deformation (distortion) transition are untenable. It has been experimentally proved that the polymorphic transformation of pure iron under equilibrium conditions under heating proceeds without diffusion with a sequential change of three phase transformations of different genesis. The jump in the atomic volumes of the phases of the α -Fe and γ -Fe polymorphs in the phase transformation region is explained not by the direct shear plastic transformation

of the crystal lattice of the α -Fe polymorph into the crystal lattice of the γ -Fe polymorph, as is customary until now, but by the sequential destructuring of the α -Fe polymorph into a mixture of “paracluster” and amorphous phases.

The present studies have identified the following unsolved problems: first, the process by which a significant amount of G activation energy is absorbed is unclear: 2300 ± 150 kJ/mol for PMZ, 2400 ± 200 kJ/mol for LZD; secondly, there is no explanation of the mechanism of transition of the iron crystal lattice to an amorphous state when heated; Thirdly, the temperature of the polymorphic transformation interval in carbon steel 20 does not coincide with the similar temperature range in the Fe–C diagram.

Keywords: differential scanning calorimetry (DSC), polymorphic transformation of iron, hysteresis of polymorphic transformation of iron, activation energy, structural transformation, polymorph of iron.

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Improvement of the method for calculating the power of motors of the main drive of the finishing group of a continuous wide strip hot rolling millPospelov I.D., Nechaev R.R. // *Stal'*. 2024. No. 2. P. 25 – 30.

To determine the power of the hot strip rolling process, the method for calculating specific work in the elastic areas of the deformation zone is supplemented by the influence of speed on the coefficient of contact friction of the strip and work rolls. For the first time, a reliable regression equation has been obtained to determine the coefficient of the rolling friction arm in the contact of the support and working rolls of the finishing group of the hot rolling mill 2000 of Severstal PJSC, which allows one to determine the power consumption spent on overcoming the rolling friction itself and the rotation of the idle support rolls. The maximum error in calculating power using the supplemented method, taking into account the above mentioned technology factors, was 11,9 %, the average was 5,5 %.

Key words: hot rolling, contact friction coefficient, rolling friction coefficient, regression equation, power calculation, finishing group of the hot rolling mill.

UDC 621.774

Points of Tension and Potential for the Development of the Pipe Industry of the Russian FederationKosmatsky Y. I., Lysov D. N., Kondratiev E. N. // *Stal'*. 2024. No. 2. P. 31 – 32.

The situation of the Russian pipe industry is considered. The authors of the article analyze the sources that studied different periods of the pipe industry's existence. The main problems and risks of this area are highlighted. The dynamics of changes in the stress points of the Russian pipe industry are reflected, and the prospects are assessed.

Key words: pipe industry, raw materials and materials, market conditions, prime cost.

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Changes in the Properties of Pipe Steel under Cold Deformation in the Process of Production of High-Strength ProfileAdigamov R. R., Andreev V. A., Rogachev S. O., Tabachkova N. Yu., Fedotov E. S., Yusupov V. S. // *Stal'*. 2024. No. 2. P. 33 – 41.

The results of a study of the changes in the structure and mechanical properties of pipe steel during the high-strength profile manufacturing are presented. A joint analysis of the