SUMMARIES

Karbowniczek M., Michaliszyn A., Wcisło Z., Ślęzak W.:

Analysis of the Effect of CO_2 Blow on the Oxidation of Iron Alloys' Elements

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Reduction of CO_2 emission can be achieved in metallurgical processes. The unit, which has high potential for reducing CO_2 emission is a blast furnace, where after the separation of CO_2 from the top gas, this gas can be recycled. Gained CO_2 can be used in steelmaking processes. The paper shows the results of CO_2 blowing into molten metal in order to oxidize carbon and silicon.

Keywords: *decarburization, refining, CO_2 recycling*

Leszczyńska-Madej B., Richert M., Sak T.:

Effect of Unconventional Methods of Cutting on Microstructure, Topography and Microhardness Changes in Steel

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The carbon steel for quenching and tempering has been cut with two different techniques, plasma arc and laser. The influence of these two unconventional methods of cutting on the changes of microstructure and properties has been studied in this paper. The structure changes after cutting were investigated by means of both light and scanning electron microscopy, additionally microhardness in the heat affected zone was measured. The performed investigations show that both methods of cutting have a strong influence on the structure and properties of investigated steels. Characteristic structure of cut area was a bainitic structure. The amount of bainite structure decreased with increased distance from the edge of the cutting sample. The plasma arc cutting influences the structure changes more than laser beam. The bainitic structure after this method of cutting was observed to a depth of near 130 micrometers (laser), whereas after plasma arc – average 400 micrometers. Measured microhardness at the edge after cutting by both methods was about 280Hv0.1 what makes up 130% increase comparing to material beyond the heat affected zone.

Keywords: *plasma arc cutting, laser cutting, structure changes, microhardness changes, heat affected zones*

Rumiński M.:

The Influence of Construction Method Selection on the Character of Hardness Curve of AISI 316Cu Acid Resistant Steel

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The paper presents the experimental investigations of AISI 316Cu austenitic acid resistant steel, which aimed at the determination of the characteristic of this steel in a form of hardness curve, i.e. the

relationship between hardness and effective strain. Three different methods were applied: the first one was based on uniaxial tension, the second one was based on frictionless compression of Rastegaev specimens, and the third one was based on multi-pass wire drawing process. As a result, three series of specimens were obtained, suitable metallographic specimens were prepared and hardness measurements were made on each specimen's cross section. The results of measurements combined with the calculations of uniform strain performed for each specimen, made it possible, with application of approximation by polynomial, to construct the functional relationship described by the equation of hardness curve of the steel under investigation. The determination of such type of material's characteristic allows to practically evaluate the state of strain and, if the flow curve is also known, the flow stress in a local scale, by means of hardness measurements.

Keywords: *acid resistant steel, uniaxial tension, frictionless compression, multi-pass wire drawing, hardness curve*

Czarski A., Matusiewicz P.:

Some Aspects of Estimation Accuracy of Mean True Interllamelar Spacing

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Lamellar microstructures are characterized by interlamellar spacings: random, apparent and true. The mean value of true interlamellar spacing can be estimated by measurements of apparent spacings, random spacings or by counting number of intersections the secant with plates. In this paper the statistical errors in true interlamellar spacing measurements has been determined and discussed using the example of pearlite in eutectoid steel. The accuracy of estimation of true interlamellar spacing using all the methods is comparable and sufficient.

Keywords: *true interllamelar spacing, lamellar microstructure, stereology*

Kuźnia M., Rozmus-Górnikowska M., Szajding A., Jerzak W.:

Chemical Analysis of Refractory Materials by SEM Technique

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In Polish industry, especially in the iron and steel industry, uses large amounts of refractory materials. Waste materials are disposed of through a common storage. For alternative methods of waste management of refractory materials, it is necessary to carry out several studies. One of the basic research include determine the chemical composition of refractory materials exposed to liquid steel. This paper presents the results of microscopic examination of changes in the concentration of refractory elements in new and used.

Keywords: *sed refractories, microscopic research, recycling of refractories*

Wilk M., Straka R., Szajding A., Telejko T.:

Numerical Study of Natural Gas Combustion in a Pusher Furnace

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The paper presents results of the preliminary numerical model of the natural gas combustion in the furnace. The production technology requirements strongly limit the possibility of any action

interfering in the process, which could improve the gas pollutants emission. The optimization of the pollutants generation, which strongly depends on the parameters of the process, is important aim to understand concerning the environmental protection regulations. The simple model of methane combustion mechanism has been studied taking into account nitrogen oxides formation. The model, using Eddy Dissipation Model, calculates the concentration of gas pollutants. The input data (e.g. geometry, flows, furnace zoning, types of applied burners etc.) were taking from real device (the pusher furnace from the rolling mill). The calculations were not included the presence of the charge in the process. The emission of pollutants from modeling of methane combustion has been presented. Although the results do not correspond with real condition of the furnace, no charge in the furnace, this first step of modeling allows the extension of the model taking into account the heat exchange in the atmosphere of the furnace.

Keywords: *natural gas combustion, Eddy Dissipation Model, NO_x production*

Kamińska J., Kmita A., Kolczyk J., Żymankowska-Kumon S.:

Reclamation of Spend Moulding Sands with the Carbophen 8178 Resin

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The aim of investigations was to collect the experimental data allowing the quality assessment of the reclaimed material obtained by means of the mechanical reclamation from spent sands with the Carbophen 8178 resin. The investigation program was as follows:

- making the moulding sand with the Carbophen 8178 resin and its preparation for the primary reclamation;
- carrying out the secondary reclamation of the spent sand in the experimental mechanical reclaimer, at several variable parameters (inclination, reclamation time, rotor rotational speed);
- necessary instrumental tests of the reclaimed spent sand and the analysis of the obtained reclaimed materials.

Investigations were carried our for three positions of the apparatus: $\alpha = 0^o, 3^o, 6^o$. The reclamation was performed for each position at three rotational speeds of impact-abrasive elements. The reclamation process effects were checked after 5, 10, 15 and 20 minutes. The reclamation results for the average rotational speed of the rotor, being 700 rpm, are presented in the paper

Keywords: *moulding sand, alpha-set technology, mechanical reclamation*

Kamińska J., Kmita A., Kolczyk J., Malatyńska P.:

Strength Parameters and a Mechanical Reclamation Together with the Management of Its By-products

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Selfsetting sands with furan resins are still the largest use of SMS with synthetic resins. They can be used to prepare such forms and cores – of different sizes and shapes, for casting all types of alloys. A reclamation of spent moulding sands, as a recycling method of waste foundry materials, originated from the casting production cycle, constitutes a very serious problem of each foundry plant, related first of all to the environment protection and also to the rational material management.

The results of furan resin sands strength tests from the matrix of pure quartz sand reclaimed was performed on the test apparatus AT-2. Sand sieve analysis was made of fresh and reclaimed material, and loss on ignition tests conducted on reclaimed material, obtained at different times of reclamation treedment. Granulation tests of post out reclamation dust, obtained from the sand were also carried of furan resin.

Keywords: *furan resin, moulding sands, reclaimed, after reclamation dust, granulation*