SUMMARIES

Fraś E., Górny M., Lopez H.F.:

Eutectic Transformation in Ductile Cast Iron. Part I – Theoretical Background

Metallurgy and Foundry Engineering – Vol. 31, 2005, No. 2, pp. 113÷136

In the present paper, heat balance is incorporated in developing expressions for the solidification kinetics of divorced eutectic in ductile cast iron taking into account nucleation and growth processes for spheroidal graphite. Accordingly, a new analytical equations were derived that describe the nodule count N and the chill and chilling tendency CT of ductile cast iron. From this analysis, it is viable to predict cast nodule counts as well as the chill and CT for ductile iron from experimental data on cooling rates, chemical composition and other factors. Finally, the effect of technological factors on the resultant nodule counts the chill and chilling tendency is considered in this work.

Keywords: *chill, chilling tendency, eutectic transformation, ductile cast iron*

Fraś E., Górny M., Lopez H.F.:

Eutectic Transformation in Ductile Cast Iron. Part II – Experimental Verification

Metallurgy and Foundry Engineering – Vol. 31, 2005, No. 2, pp. 137÷147

In this work the predictions of a proposed analytical theory aimed at elucidating factors influencing on the nodule counts, the chill and the chilling tendency of nodular cast iron were experimentally verified. The experimental work was focussed on processing nodular cast iron under various inoculation conditions in order to achieve various physicochemical states of the experimental melts. In addition, plates of various wall thicknesses were cast and the resultant chilling tendency was established. Metallographic evaluations were made to determine the exhibited nodule counts in the experimental plates. Moreover, thermal analysis of these nodular cast irons was used to find out the degree of maximum undercooling for the graphite eutectic ΔT_m. Finally, calculations were made using previously derived analytical expressions to determine graphite nodule counts, chilling tendency and critical wall thicknesses, below which the chill appears. From this analysis, it was found that there is good agreement between the theoretical predictions and the experimental outcome.

Keywords: *chill, chilling tendency, eutectic transformation, ductile cast iron*

Longa W., Khatemi B.:

The Theoretical Background for Calculation of Geometrical Parameters of the Stable Melting Zone in Single-Row Coke Cupolas

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In the present work, the stable melting zone was divided into sequences (systems) of the melting pieces of metal, to derive next some equations used in calculation of the mean volume and surface area of the pieces in individual sequences (for plates of any arbitrary value of their relative dimensions).

The analysis of the obtained relationships has proved that in calculation of the geometrical parameters of the melting zone (zone height, mass of melting metal, surface of development, number of the melting pieces of metal) it is possible to use the term of a mean integral volume and mean integral surface area of the pieces of metal in a zone.

Keywords: *cupola, coke, melting zone, metal*

Wiencek K., Skowronek T., Khatemi B.:

Graphite Particle Size Distribution in Nodular Cast Iron

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A system of non-overlapping random spheres, whose diameters have the Weibull distribution may be used as a model for the graphite in nodule cast iron. For a given material, the model probability density function of the Weibull distribution may be determined (as the first approximation) by fitting the PDF of model profile diameters to the one of graphite particle sections. The Weibull distribution may be used as the basis for quantitative metallography of the graphite phase in nodular cast iron.

Keywords: *quantitative metallography, particle size distribution, statistics, stereology, Saltykov algorithm, nodular cast iron*

Hutera B., Drożyński D.:

An Effect of Aromatic Diluent Addition on the Selected Properties of Epoxy Resin

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The article describes the studies which have been conducted on the dynamic wetting of quartz grains by EPIDIAN 5 resin and by this resin with an addition of 5 wt. %, 20 wt. % and 30 wt. % of xylene at different temperatures. In the case of the investigated resin, the wetting process dynamics is best described by a logarithmic function: $\theta = -A \ln t + B_0$, where: θ is the contact angle after time t, and A and B_0 are constants characteristic of this process at a given temperature. It has been proved that with 5 wt. % addition of xylene both constants assume a value different than zero. With addition of 20 wt. % and 30 wt. % of xylene, the state of equilibrium is reached almost immediately, and it is expressed by a zero value of constant A.

The infra-red spectroscopy did not reveal the presence of any chemical reactions between the EPIDIAN 5 resin and xylene, thus confirming that the chemical structure of xylene molecule affects the type of interaction and proves the non-active behaviour of xylene as a diluent. The importance of the studies for foundry sand practice has been stressed.

Keywords: *contact angle, wettability, binder*

Karczewski K.:

Universal Method of Calculation of Radiation Recuperators with Microfinned Surface

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Universal method of calculation of radiation recuperators with microfinned surface were elaborated. The algorithm of method applied: model investigations of heat transfer and hydraulic resistance

on recuperator elements with microfins, the surface ratio and micro-fin efficiency. The universal method of calculation developed in the paper makes possible the recuperator's design to industrial furnace.

Keywords: *microfinned surface ratio, heat transfer rate, volumetric rate of fluid flow, microfin efficiency, recuperator*

Malinowski Z., Madej W., Musiał A., Hajduk Z., Wolski A.:

Design of Manufacturing of *Welding Neck* Type Rings

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Computer aided design of the rolling process for *welding neck* 20" and 24" type rings on the Thyssen–Wagner 125–100 mill is described in the paper. Numerical simulations of processes of preform shaping and ring rolling were performed using ring-roll finite element software. The optimal shape of the preform and rolling curve were selected on the basis of results of simulations, as well as on the basis of experimental data. Values of stresses, strains, strain rates and temperatures during rolling were determined and results were validated by comparison with the data monitored during the real industrial process. Obtained results were used for the design of tools for forging and rolling of welding neck type rings.

Keywords: *ring rolling, finite element method, preform design*