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1
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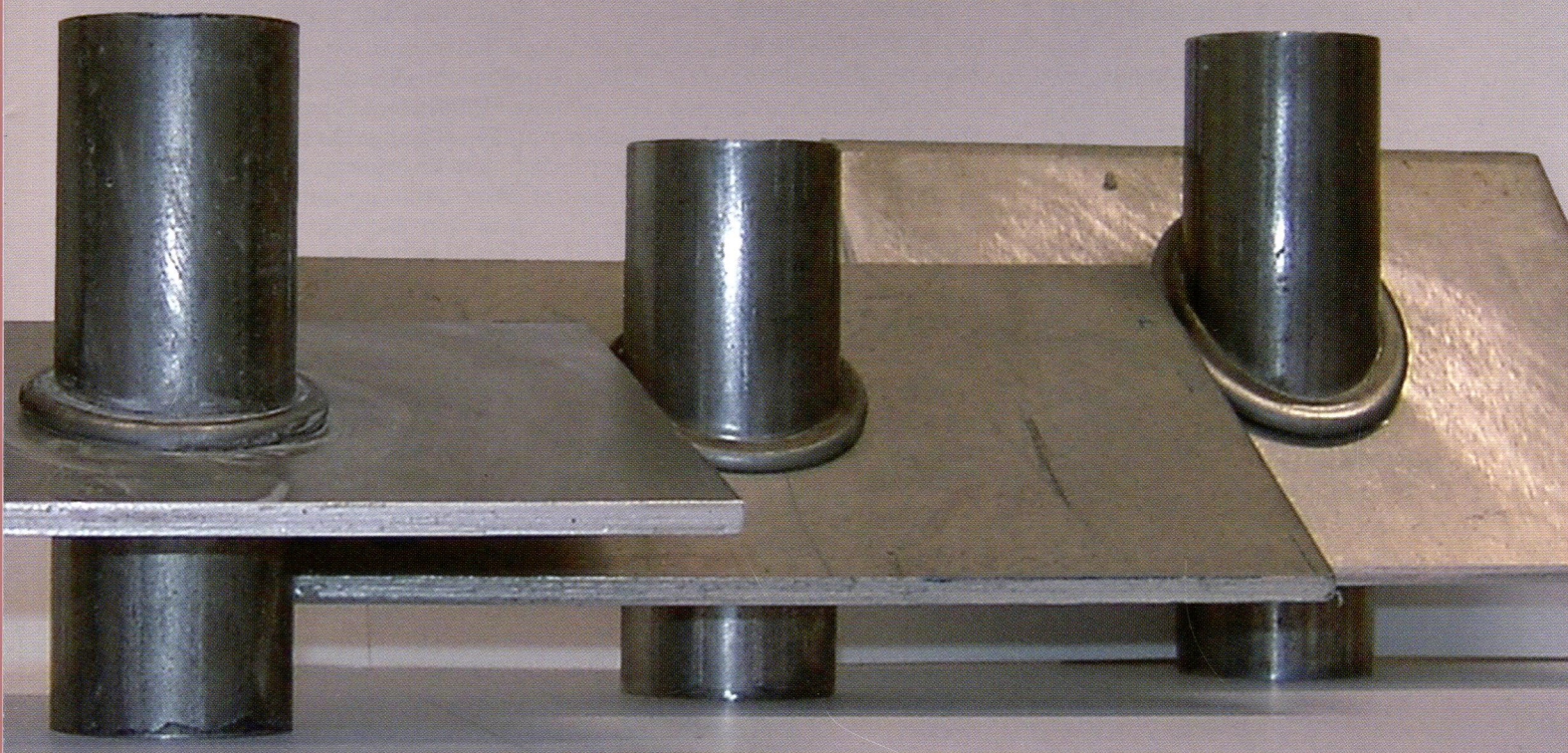

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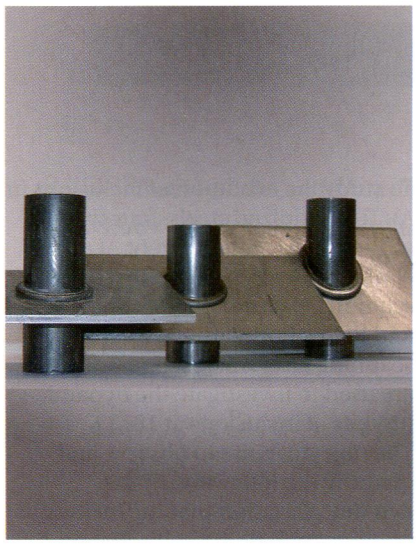

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Cover Photo:

The cover page shows inclined tube-sheet joints that were produced by an innovative process based on asymmetric local buckling of tubes subjected to axial compression. The process is adequate to produce complex joints made from dissimilar materials at room temperature and copes with growing environmentally concerns about smells, fumes and hazard materials that are produced in alternative solutions based in welding or structural adhesives. More details can be found in the article by P. A. F. Martins and co-workers on page 67 ff.

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Contents

Editorial
T. Adams

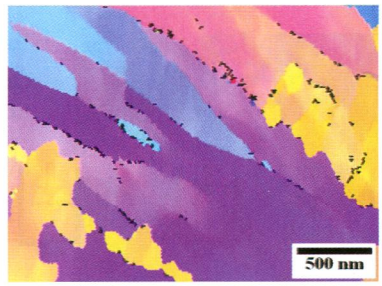
85 years of Steel Research

7

Full Paper
V. V. Basabe,* J. J. Jonas and C. Ghosh

Formation of Widmanstätten Ferrite in a 0.036% Nb Low Carbon Steel at Temperatures Above the Ae_3

8



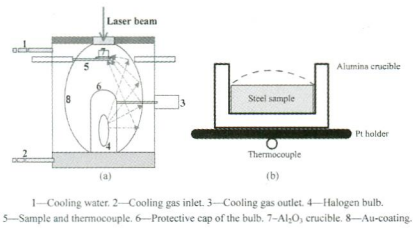
When austenite is deformed above the Ae_3, very fine Widmanstätten plates are formed, which are only about 200 nm wide. On continued deformation, the plates coalesce into polygonal grains. Because of the fine scale of the microstructure, these are difficult to detect using conventional optical microscopy.

Contents

D. Wang,* M. Jiang, H. Matsuura and F. Tsukihashi

Dynamic Evolution of Inclusions in Ti-Bearing Al-Deoxidized Molten Irons at 1873 K

16



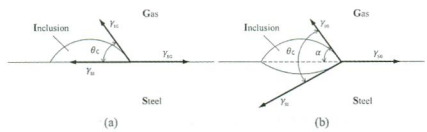
1—Cooling water. 2—Cooling gas inlet. 3—Cooling gas outlet. 4—Halogen bulb. 5—Sample and thermocouple. 6—Protective cap of the bulb. 7-Al_2O_3 crucible. 8—Au-coating.

To study the evolution of inclusions in Al/Ti-deoxidized steels, four types of molten irons with different Al and Ti contents are prepared. Subsequently, scanning electron microscope (SEM) and high-temperature confocal scanning laser microscope (CSLM) are used to investigate the dynamic process of inclusions at 1873 K. The objectives are to observe and quantify the following: (i) the dynamic variation that the inclusions undergo and (ii) the collision and agglomeration behavior of inclusions on the surface of melts.

G. Yang,* X. Wang, F. Huang, W. Wang and Y. Yin

Transient Inclusion Evolution during RH Degassing

26

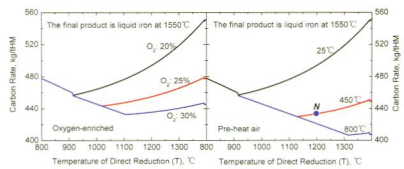


Inclusion morphology, composition and number at different times of RH vacuum treatment are investigated on API-X70 pipeline steel with ASPEX. It is found that the inclusions are mainly globular $CaO–Al_2O_3–MgO$. The inclusion number decreases with time and the final number is highly associated with the initial number. Furthermore, non-liquid inclusions decrease much more quickly and thoroughly than liquid ones. Interfacial property is employed to explain the different removal behaviors.

X. Jiang,* L. Wang, F. Shen and W. Lu

Adiabatic Carbon Rate of Alternative Ironmaking Processes to Produce Hot Metal

35

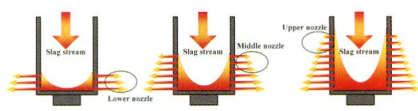


In present work, adiabatic carbon rates are compared between smelting reduction and direct reduction along idealized conditions. Both oxygen-enrich and pre-heating air are optimized methods to decrease carbon rate of hot metal production. From the figure, the total adiabatic carbon rate of " Direct reduction-Melting" process may be lower than 440 kg tHM^{-1}.

Q. Yuelin, L. Xuewei,* B. Chenguang, C. Pan, Q. Guibao and Z. Jie

Mechanism of Dry Molten Slag Granulation Using a Rotating Multi-Nozzle Cup Atomizer

44



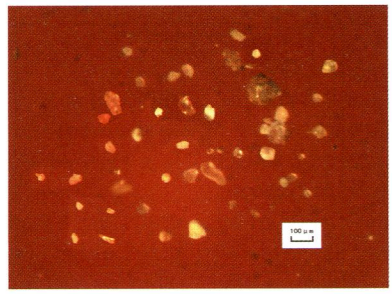
The rotary multi-nozzle cup atomizer is proposed to granulate the molten slag at a high cooling rate without water consumption in this study. The disintegration mechanism, flight trajectory and heat transfer models of the droplet have been successfully developed. The results can provide guidance for designing the commercialized atomizer and optimizing the operation parameters of atomizer.

Contents

W. Yan,* H.-c. Xu and W.-q. Chen

Study on Inclusions in Wire Rod of Tire Cord Steel by Means of Electrolysis of Wire Rod

53

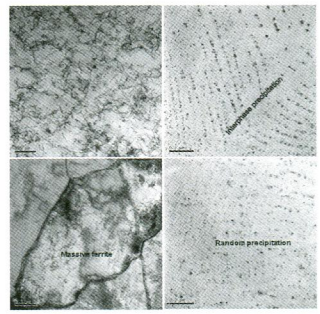


This paper presents a new, visualized, and effective detection method used to study on inclusions in wire rod of tire cord steel. In comparison with conventional test methods such as metallographic microscope, scanning electron microscope, and big sample electrolysis, this method has less limitation and higher accuracy in evaluation of appearances and origins of inclusions in tire cord steel.

S.-J. Yao,* L.-X. Du and G.-D. Wang

Microstructure of Nb-Bearing Pipeline Steel with Improved Property Applying Ultrafast Cooling Process

60

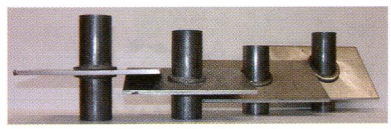


The comprehensive property of Nb-bearing pipe line steel processed with ultrafast cooling is corporately improved through dislocation and precipitation strengthening, while the matrix microstructures are mostly massive ferrite characterized by sharpedged curved grain boundary.

A. Gonçalves, L. M. Alves and P. A. F. Martins*

Inclined Tube-Sheet Plastically Deformed Joints

67

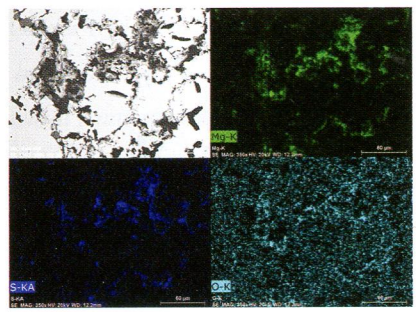


This paper provides the major operating parameters, the process window and the overall design of the tooling setups that are utilized to produce strong, flexible and environmental friendly inclined tube-sheet plastically deformed joints. The presentation draws upon the fundamentals of asymmetric local buckling of thin-walled tubes subjected to axial compression and is supported by applications with metals and polymers for the benefit of those who work with sheets and tubes in daily practice.

D. Lindström, P. Nortier and D. Sichen*

Functions of Mg and Mg–CaO Mixtures in Hot Metal Desulfurization

76



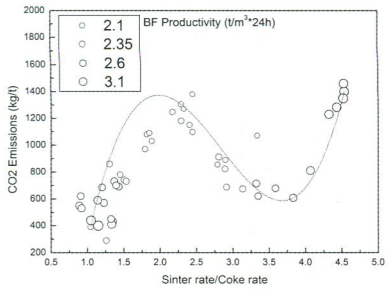
The hot metal desulfurization mechanisms using Mg and Mg–CaO mixtures were studied. Most added Mg quickly escaped in 2 s. MgS was not formed by homogeneous nucleation but by formation on oxide particles. When tiny CaO particles were added together with Mg, Mg-gas helped distribution of CaO particles in hot metal and improved kinetics. Most CaO particles sized <10 m were completely transformed to CaS whereas CaO particles >10 m still had CaO in the center after 20 s.

Contents

P. Cavaliere* and A. Perrone

Optimization of Blast Furnace Productivity Coupled with CO_2 Emissions Reduction

EDITOR'S CHOICE 89

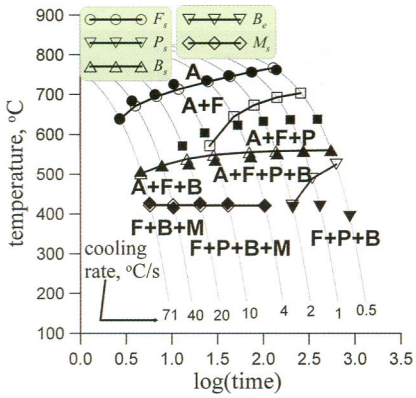


Input parameters influencing blast furnace (BF) operating conditions have been analyzed in the present study. The study suggests new solutions in all processing parameters in order to improve plant productivity and to reduce the dangerous emissions. As a general point of view, the precise control of all the main processing parameters from the sintering operations to the BF ones lead to a strong reduction in dangerous emissions and to good levels of plants productivity. Through the employment of a multi objective optimization tool, it was possible to identify an optimal set of operating conditions leading to a maximization of the plant productivity coupled with a minimization of the greenhouse gas emissions.

M. Pietrzyk,* R. Kuziak, K. Radwański and D. Szeliga

Physical and Numerical Simulation of the Continuous Annealing of DP Steel Strips

99

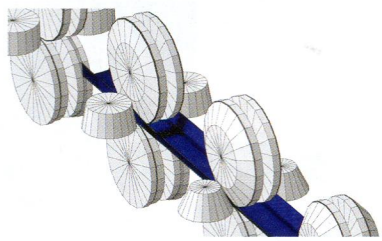


Manufacturing of DP steel products is a complex process. Special thermal cycles during annealing are applied to obtain two-phase microstructure. Development of the model for the continuous annealing of DP steels was the objective of the paper. Experimental part included dilatometric tests and physical simulations of various annealing cycles. It supplied data for identification and validation of the model. Good predictive capabilities of the model were confirmed.

P. Groche, C. Mueller,* T. Traub and K. Butterweck

Experimental and Numerical Determination of Roll Forming Loads

112



The knowledge of the loads occurring in the roll forming process is important for the design and dimensioning of the process. One option to detect these loads provides the simulation. Due to simplifications in the used simulation model and the unknown interactions between sheet metal and roll forming machine, important parameters, such as contact normal pressure cannot be displayed realistically. This paper shows a way to quantify these variables in the simulation.