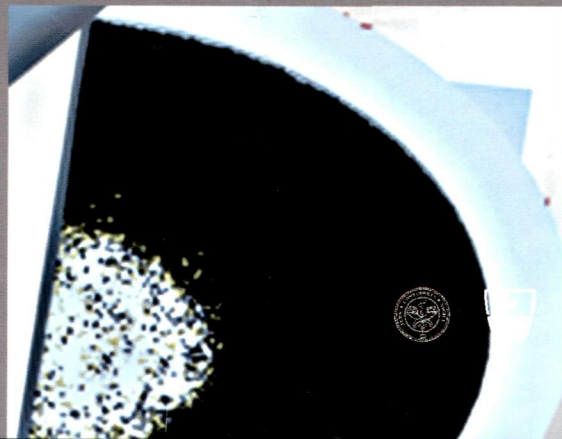
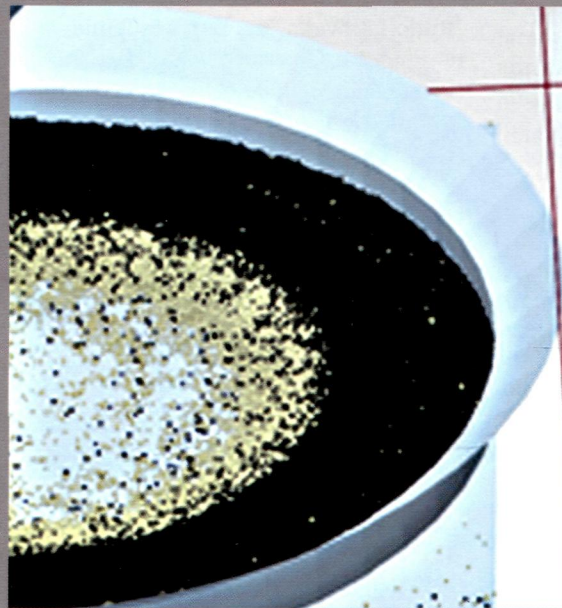
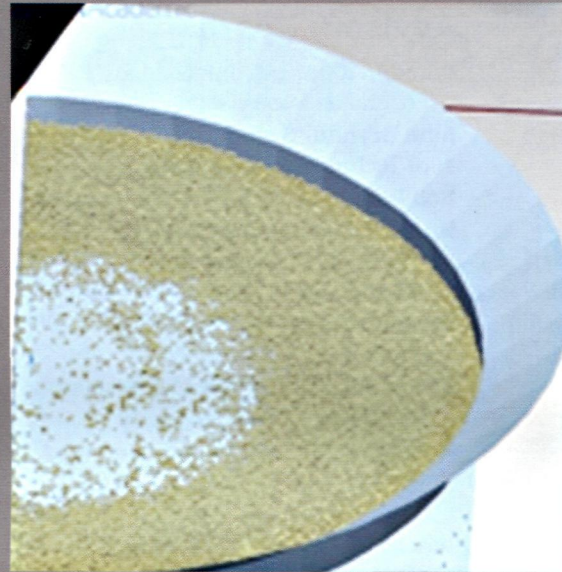


steel research

international

October · Vol. 84 · DP17644

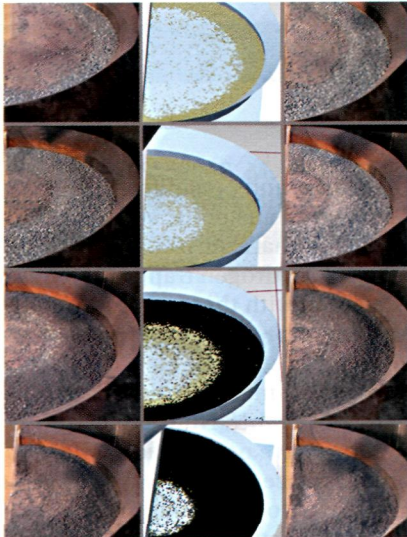
10
2013



www.steel-research.de

WILEY-VCH





steel research

international



www.steel-research.de

Cover Photo:

The cover shows a top view of burden distribution in experiment and simulation for the eight pellet rings of the program described in the manuscript by Yaowei Yu and Henrik Saxén on page 1018.

Publishing company:

Wiley-VCH Verlag GmbH & Co. KGaA, Boschstraße 12, D-69469 Weinheim, Germany

Contents

Review

O. Bouaziz, H. Zurob, and M. X. Huang*
Driving Force and Logic of Development of Advanced High Strength Steels for Automotive Applications

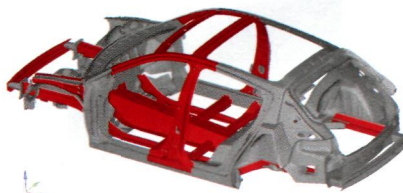
EDITOR'S CHOICE

937

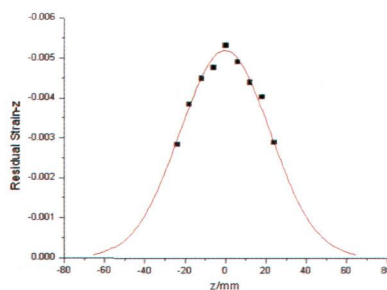
Full Paper

K. Chen,* K. Liu, H. Chen and Y. Yang
Function Representation for the Strain Field during the Steel Forging and Its Application on the Deformation of Void Defects

948



The development of Advanced High Strength Steels (AHSS) began with the aim of improving passenger safety and weight-saving. The image shows the automotive parts (in red) that are made of AHSS.

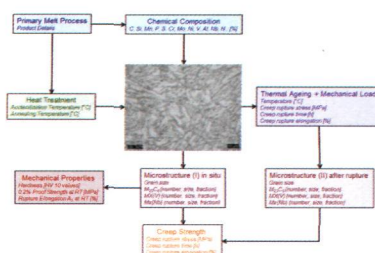


A novel method for description of the strain field distributions during the steel forging is proposed in the present study, i.e., the function representation for the strain field, which combined experimental analysis and mathematical function analysis, as shown in the figure. Then the method is applied to calculate the deformation of internal void defects and to predict its closure during the practical process.

O. Frolova and K. Maile*

Advanced Methods for Assessing the Melt-Specific Creep Rupture Behavior of P91 Steel for Power Plants

956

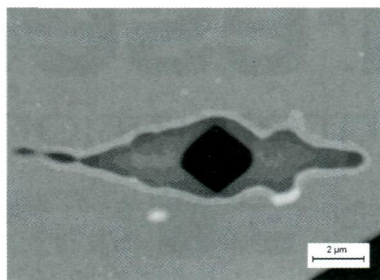


The emphasis of this study is to determinate the position of the specific melts in the scatter band of creep rupture data as well as to assess/predict time-to-rupture for the given steel under consideration of all relevant technical data available and to find out an optimum of the creep rupture strength.

Contents

H. Pulkkinen,* S. Papula, O. Todoshchenko, J. Talonen and H. Hänninen
Effect of Inclusions and Precipitates on Hydrogen Embrittlement of Mn-Alloyed Austenitic Stainless Steels

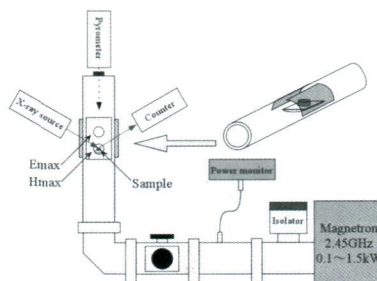
966



Inclusions and precipitates in Mn-alloyed austenitic stainless steels are characterized and their effect on hydrogen trapping examined with thermal desorption spectroscopy. In an experimental Nb-alloyed stainless steel large number of small precipitates (e.g., NbC, NbN, Nb(C,N)) exist, but they have no beneficial effect on resistance against delayed cracking. Modifications for the manufacturing process are suggested to obtain better hydrogen trapping properties.

N. Sabelström, M. Hayashi,* Y. Yokoyama, T. Watanabe and K. Nagata
XRD In Situ Observation of Carbothermic Reduction of Magnetite Powder in Microwave Electric and Magnetic Fields

975



Microwave energy is expected to be a heat source for high temperature process aiming at CO₂ reduction and energy conservation owing to the possibility of volumetric and selective heating. In order to examine the applicability of microwave heating to ironmaking, a basic research was conducted with respect to the heating mechanism of raw and product materials of ironmaking as well as the carbothermic reduction mechanism of iron oxide using a single mode microwave furnace combined with X-ray diffraction analysis.

H.-P. Heller,* M. Hötzel, B. Lychatz and N. Haustein
Avoidance of Calibrating Errors with Viscosity Measurements of Metallurgical Slags

982



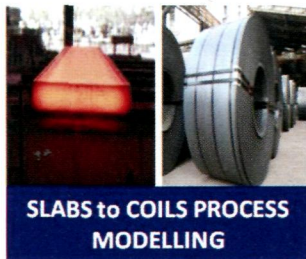
Based on known calibration problems with high-temperature measurements, the viscosity is calculated directly without calibration. This is possible with an air-bearing rheometer and exact absolute torque measurement via the electrical parameters of the drive and via movement parameters and geometry. This technique meets the desired requirements in view of measuring accuracy and reproducibility.

Contents

P. Agarwal,* R. Sah, R. Madhusudhan,
S. Manjini and A. Chandra

Optimization in Rolling and Cooling Process of Line Pipe Steels

991

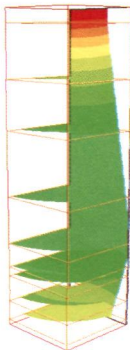


Optimized microstructure and mechanical properties are the key requirements for line pipe steels. The validation of phase transformation in line pipe steel bases on plant based trials. Variable rolling parameters effect on the final mechanical properties of steel.

R. Safavi Nick, A. Tilliander, L. T. I. Jonsson
and P. G. Jönsson*

A Mathematical Model of the Solid Flow Behavior in a Real Dimension Blast Furnace: Effects of the Solid Volume Fraction on the Velocity Pro- file

999



It is shown that the particle velocity increases in the upper part of the furnace up to the tuyeres level with a decrease in the packing density from 0.74 to 0.71 and 0.68 while all other parameters were kept constant. The shrinkage in the size of the particles is not applied to the model. However it is plausible to say that an increase in the packing density of the bed decreases the velocity magnitude. This, in turn, increases the resident time of the particles.

Y. Dong,* Z. Jiang, L. Medovar,
G. Stovpchenko, X. Zhang, X. Zang and
X. Deng

Temperature Distribution of Electro- slag Casting with Liquid Metal Using Current Conductive Ring

1011

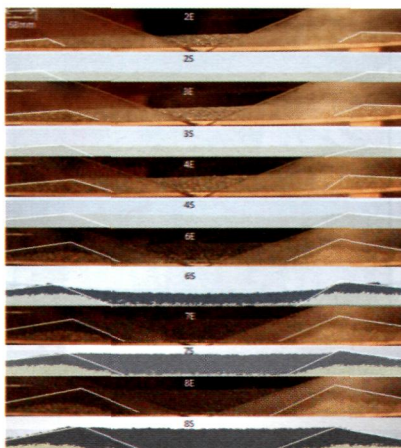


In this work, electroslag casting process with liquid metal ESC LM using current conductive ring has been developed. Liquid metal after refining is introduced into the mold directly. Simulation has been carried out for understanding the process. Results of industrial trial indicate that Ingot quality manufactured by ESC LM process is equivalent to the conventional electroslag ingot. The production efficiency of ESC LM process is obvious higher than conventional electroslag remelting operation.

Y. Yu* and H. Saxén

Particle Flow and Behavior at Bell- Less Charging of the Blast Furnace

1018



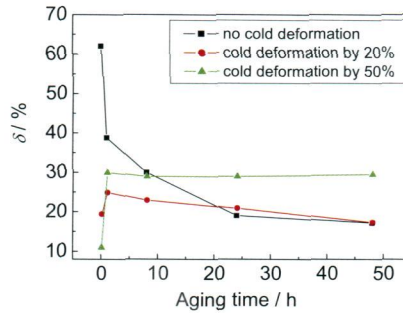
The formation of pellet and coke dumps in the blast furnace is studied in smallscale experiments and by discrete element modeling DEM. The experimental setup is reproduced in the simulations, which makes it possible to compare and verify the DEM results. The distribution of the burden layers, the behavior of single particles on the burden surface and the size segregation of pellets are investigated. It is demonstrated that the modeling technique can capture the general behavior of the charging process as particles flow on and from the rotating chute to form rings on the burden surface.

Contents

S. Feng, L. XiaoWu, Q. Yang and L. ChunMing*

Effects of Cold Deformation and Aging Process on Precipitation Behavior and Mechanical Properties of Fe-18Cr-18Mn-0.63N High-Nitrogen Austenitic Stainless Steel

1034

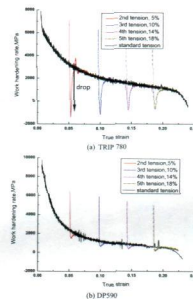


The effects of different treatments (solid solution + cold deformation + aging condition) on the microstructure of Fe-18Cr-18Mn-0.63N high-nitrogen austenitic stainless steel and consequently on its mechanical properties are investigated. The results show that precipitation of the second phase particles, the strain recovery, and recrystallization under different treatment conditions bring about different mechanical properties in the experimental steel.

H.-Y. Yu* and C.-C. Ai

Work Hardening Response of Transformation-Induced Plasticity and Dual-Phase Steels to Prestrain

1040

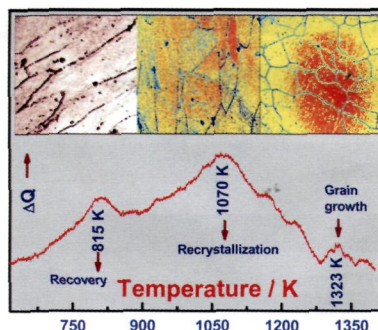


The work hardening behavior of TRIP780 and DP590 steels are discussed. Results show that DP steel has higher work hardening rate than TRIP steel at small prestrain and the trend is reverse when prestrain is larger than 2.5%. The max elastic modulus degradation could reach 18 and 10% for TRIP780 and DP590 steels, respectively.

H. Tripathy, S. Raju,* A. K. Rai and T. Jayakumar

A Calorimetric Study of Recovery and Recrystallization in Fe-14.4 Cr-15.4 Ni-2.4 Mo-2.36 Mn-0.25 Ti-0.04 C-0.05 P (mass %) Austenitic Stainless Steel

1046



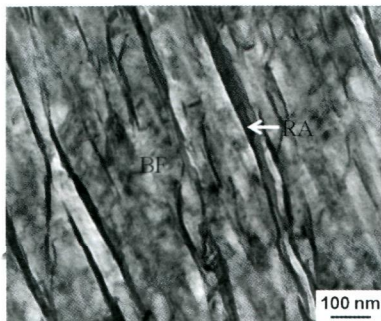
Thermally activated dissipation of stored energy and resulting microstructural reorganization of a Ti-added steel have been monitored by dynamic calorimetry. The studies reveal that the kinetics of stored energy release and resulting structure formation is basically a dispersive one, involving more than one relaxation time. However, it is possible to isolate the energy barriers for recovery and recrystallization stages by modeling the rate of energy dissipation through isokinetic formalism of thermally activated rate processes.

Contents

F. Hu, K. M. Wu* and H. Zheng

Influence of Co and Al on Bainitic Transformation in Super Bainitic Steels

1060

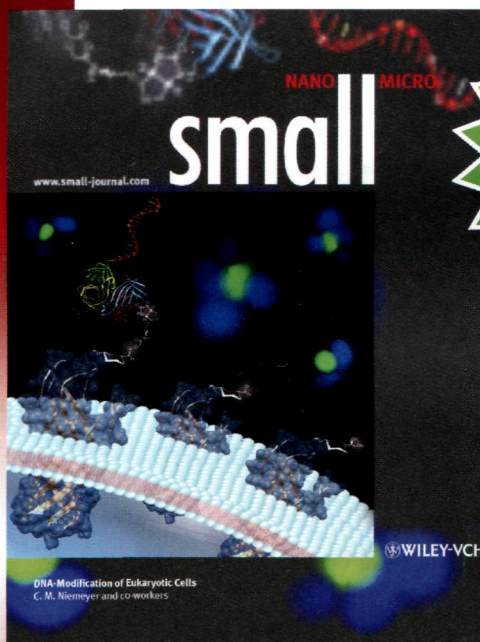


The mixed microstructures of nanosized bainitic ferrite plate (≈ 33 nm) and retained austenite is obtained by isothermal transformation at low temperatures. The thickness of bainitic ferrite is reduced and the volume fraction of bainitic microstructure is increased in the Co and Al containing steel compared with the parent steel.

No small Matter Nano and Micro:

For subscription details please contact Wiley Customer Service:

- >> cs-journals@wiley.com
(Americas, Europe, Middle East and Africa, Asia Pacific)
- >> cs-germany@wiley.com
(Germany, Austria, Switzerland)
- >> cs-japan@wiley.com
(Japan)



Impact Factor
8.349

2011 Journal Citation Reports™
(Thomson Reuters, 2012)

provides the very best forum for experimental and theoretical studies of fundamental and applied interdisciplinary research at the micro- and nanoscales

2013, Volume 9, 24 issues.
Print ISSN 1613-6810 / Online ISSN 1613-6829

WILEY
WILEY-VCH



For more information please visit

www.small-journal.com

or contact us at small@wiley-vch.de

5223701302_bu