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Special Section:
Fast Algorithms for Forming Processes

Guest Editor: Rudolf Kawalla

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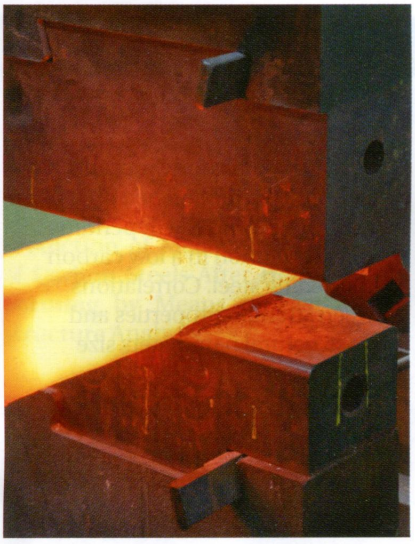

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Cover Photo:

This issue contains several contributions from the priority program "Fast Algorithms for Material Specific Process Chain Design and Analysis in Metal Forming". Eight different universities were involved in the research. As for the cover image further details can be found in the article by D. Rosenstock et al. on page 1348 ff.

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Special Section: Fast Algorithms for Forming Processes

Editorial

R. Kawalla

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Full Paper

W. Bleck, D. Hömberg, U. Prahl, P. Suwanpinij, and N. Togobytska*

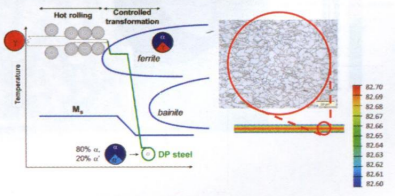
Optimal Control of a Cooling Line for Production of Hot Rolled Dual Phase Steel

EDITOR'S CHOICE 1328

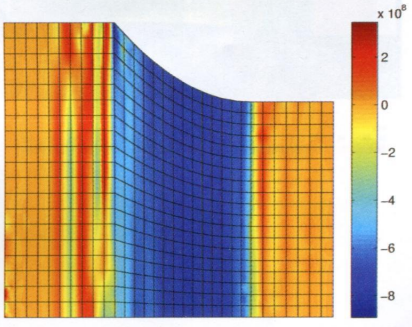
J. Seidel* and O. G. Ernst*

Model Reduction for Cold Rolling Processes

1334



In this paper, the optimal control of a cooling line for production of dual phase steel in a hot rolling process is discussed. The optimal cooling strategy for the adjustment of desired dual phase microstructure has been found by means of mathematical control theory. The results have been verified in hot rolling experiments at the pilot hot rolling mill.



The numerical simulation of cold rolling processes is considered. To accelerate the calculation for parameter variations a model reduction approach is applied. In particular, the proper orthogonal decomposition combined with the discrete empirical interpolation method is considered and allows to speed-up the simulation time.

Contents-Special Section

O. Grydin,* F. Nuernberger, Y. Zou, M. Schaper, and A. Brosius

Formation and Properties of Mixed Ferritic–Martensitic Microstructures in the Air-Hardening Steel LH800

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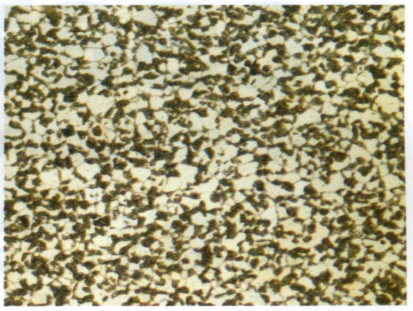

The experimental study presents results of the formation of a dual phase microstructure and the depending property evolution in a low carbon air-hardening steel. Correlations between strength properties and microstructural parameters size are determined.

D. Rosenstock,* D. Recker, M. Franzke, G. Hirt, D. Sommler, K.-J. Steingießer, A. Tewes, R. Rech, B. Gehrmann, S. Kirchhoff, and R. Lamm

Online Visualization during Open Die Forging and Optimization of Pass Schedules

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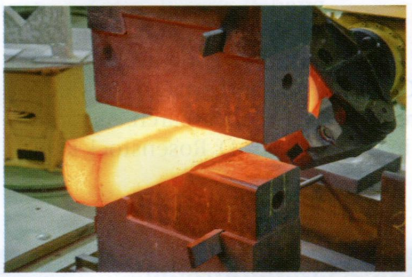
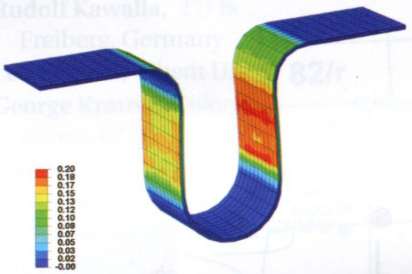


Monitoring and controlling of workpiece properties throughout the open die forging process is of particular importance. Due to the fact, that these values cannot be measured directly for the inner part of an ingot during the process, fast calculation models are used to evaluate workpiece properties online.

T. Dally, A. Grigorescu, C. Müller-Bollenhagen, M. Zimmermann, H.-J. Christ and K. Weinberg*

Using Martensite Formation during Tube-Forming to Optimize Fatigue Strength

1355

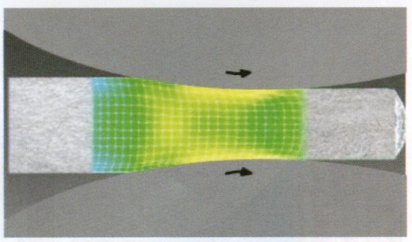


The evolution of α′-martensite in a tube-forming process is investigated. An increase of initial temperature and strain rate reduces the rate of martensite formation. Furthermore, the effect of martensite volume fraction on the fatigue behavior is examined and an optimum volume fraction is proposed for the HCF and the VHCF case.

M. Graf* and R. Kawalla

Approaches for a Fast Analysis System for Hot Rolling Processes

1364



The demands on the forming process for the production of semi-finished to finished parts increase. To meet these requirements, fast numerical simulation systems are mainly used for the process design. Material-specific parameters have to be identified experimentally and should comply with technological conditions of the real process.

Contents-Special Section

D. Šimek,* A. Oswald, R. Schmidtchen, M. Motylenko, G. Lehmann, and D. Rafaja

Prediction of Mechanical Properties of Carbon Steels After Hot and Cold Forming by Means of Fast Microstructure Analysis

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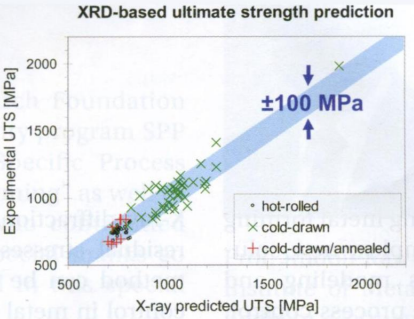

A new method for fast microstructure analysis of heavily deformed, F–P steels has been developed, based on X-ray diffraction. The method provides information about residual stresses and microstructure defects occurring in the material and therefore allows reliable estimation of strength properties of steel C45 after hot and cold deformation.

Contents

S. Yamamoto,* M. Tanaka, K. Kajikawa

Rate of Hydrogen Desorption in Mold Stream Degassing Process

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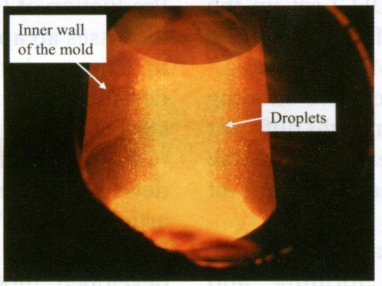

The rate of hydrogen desorption in the mold stream degassing process was measured to investigate the effect of hydrogen partial pressure. The hydrogen desorption reaction was controlled by metal side mass transfer at the gas/metal interface.

N. Saeidi,* F. Ashrafizadeh, B. Niroumand, and F. Barlat

Evaluation of Fracture Micromechanisms in a Fine-Grained Dual Phase Steel during Uniaxial Tensile Deformation

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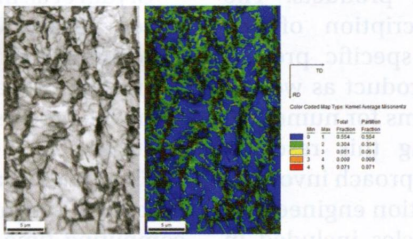

Detailed microstructural analysis reveals that interface decohesion at triple junctions of ferrite–ferrite–martensite is the dominant void nucleation mechanism. EBSD analysis also reveals that void nucleation is predominantly promoted by the increase of ferrite–ferrite grain boundary misorientation with strain.

S. Yu,* J. Miettinen, and S. Louhenkilpi

Modeling Study of Nitrogen Removal from the Vacuum Tank Degasser

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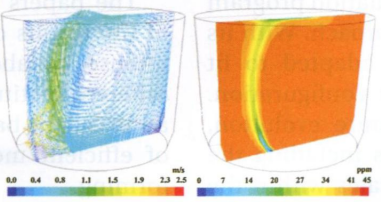

This paper presents an integrated CFDs model for simulating the nitrogen removal in an industrial vacuum tank degasser (VTD). The effect of various elements on denitrogenation rate in the VTD is studied.