Table of Contents

Plenary Session

Development of Iron and Steel Industry in China ........................................... (3)
Yin Ruiyu

Microstructures and Their Characterization of Modern Very Low Carbon HSLA Steels .... (13)
T. Araki, K. Shibata

Automotive Steels—Recent Developments in Steels Used in the Manufacture of Automobiles
and Trucks .............................................................................................................. (22)
G. Tither and H. Stuart

Microalloying in South America ........................................................................... (36)
Pascoal J. P. Bordignon

The Manufacture, Properties and Weldability of Vanadium-Containing Steels .......... (46)
P. S. Mitchell and W. B. Morrison

Low and Microalloyed Steels for the Auto Industry—Review of Research and State of Production in Russia ................................................................. (57)
N. M. Fonstein and O. N. Yakubovsky

Physical Metallurgy in HSLA Steels—Theory and Practice ................................ (66)
T. Gladman

HSLA Steels for Automobile ................................................................................ (72)
H. Takechi

Application of the Metallurgical Model to Hot Strip Rolling of Plain Carbon Steels .......... (82)
O. Kwon, K. J. Lee, J. K. Lee, K. B. Kang, J. K. Kim, J. D. Lee and J. Kim

Weldable Copper Strengthened Low Carbon Steels ............................................. (90)
D. Dunne

New Concepts in the Design and Processing of High Performance Steels ............. (99)
A. J. DeArdo

Development of Microstructure in Low Carbon Microalloyed Steel under Simulated Hot
Strip Rolling Conditions ....................................................................................... (113)
A. Halder, S. K. Tiwary, R. N. Chattopadhyay and A. Chatterjee
Physical Metallurgy

Mechanical Properties of Cold-Worked and Nitrided Fe-Nb and Fe-Nb-Mn Alloys ................................................................. (123)
Masatoshi Sakamoto

Effects of the Microalloying Elements V, Ti on Microstructure and Mechanical Properties of Steel 16Mn .......................................................... (129)
Li Hongde, Li Shijie, Zhou Weihong

The Influence of Vanadium Additions on the Ferrite Microstructure in HSLA Steels .......... (133)
M. Zhang and D. V. Edmonds

Microstructure of Nb-V Microalloyed HSLA Steel ................................................. (138)
Shan Yiyin, Wang Qingjiang, Qian Bailian, Wang Yikang, Li Aibai, Hu Jinlan

Application of Nb-Ti Combined Microalloying in the Development of Pipeline for Oil and Natural Gas Transportation ....................................................... (143)
Chen Rongqing, Lee Jingshan

The Structural Integrity of High Strength Low Alloy (HSLA) Steels ............................... (150)
S. E. Webster

Effect of Niobium on Static Recrystallization of Hot-Deformed Austenitic HSLA Steel Analogue Alloy .............................................................. (157)
A. A. Zadeh and D. Dunne

Theoretical Models for Grain Size Refining During Dynamic Recovery and Dynamic Recrystallization of HSLA Steels ....................................................... (163)
He Yizhu, Chen Dahong, T. Q. Lei, Yu Liang and Wu Huiying

Interaction Between Precipitation and Recrystallization During the Hot-Rolling of Nb- Containing HSLA Steels ................................................................. (169)
W. P. Sun, E. B. Hawbolt, T. R. Meadowcroft and J. J. Jonas

Formation of Annealing Texture in Rolling IF Steel Sheet ............................................ (175)
Mao Weimin, Wang Xu, Zhang Shouhua

Recrystallization in Nb and Nb-Ti Microalloyed Steels Investigated by the Stress Relaxation Method ............................................................ (179)
L. P. Karjalainen

Relationship of the Cold Rolling Texture and Dispersed Particles to the Annealing Textures in Low Alloy Deep-Drawing Steel Sheets .................................... (185)
Qiu Li, Zhang Weihan and Gu Chunyang
A New Method for Characterization of Recrystallization in Cold-Rolled and Annealed HSLA Steel Sheet ................................................................. (190)
V. Pantea, J. H. Sokolowski, D. O. Northwood and X. C. Sun

Texture Characteristic of IF Steel During Continuous Annealing ....................... (196)
Chen Liqing, Liu Yansheng, Liang Zhide and Cheng Xian

Precipitation Behavior of Carbides and Nitrides in Interstitial Free Steel With Co-Addition of Ti and Nb ................................................................. (199)
Sun Quanshe, Cheng Jian and Kong Bingyu

Carbonitride Precipitation Behaviors in Ti and Ti-Nb Microalloyed Steels ................. (203)
J. Y. Yoo, S. T. Hong, and W. Y. Choo

The Behavior of Vanadium in Cast Steel ............................................................ (208)
Guo Yuanxiu

The Morphology of Vanadium Carbide and Copper Precipitation in Steels .................. (215)
F. A. Khalid and D. V. Edmonds

Behaviors of Microalloying Element Ti in High Strength Hot Dip Galvanized Steel .......... (221)
Liu Zhao

The Precipitation of Vanadium Nitride During a Simulated Thermo-Mechanical Treatment and Its Effect on the Mechanical Properties of HSLA Steels ................................. (226)
Wang Kai

Ferrite Grain Coarsening During the Transformation of Deformed Austenite ................. (231)
R. Priestner and A. M. A. Al-Badri

Carbonitride Precipitation in Low-C, Nb-Ti Microalloyed Steel Castings .................. (237)
R. Priestner, X. Yu and C. Zhou

Alternative Approaches to the Microstructure-Strength Relationship of LC and HSLA Steels ................................................................. (243)
W. Osterle

Estimation of Stored Deformation Energy in Deformed Austenite of a Niobium Microalloyed Steel by Hot Torsion Test .................................................. (247)
Liu Xiaodong, J. K. Solberg and R. Gjengedal

Torsion Simulation of $\gamma \rightarrow \alpha$ Transformation Kinetics After Multi-Pass Deformation of Steels ........................................................................... (253)
Liu Xiaodong, J. K. Solberg and R. Gjengedal

The Effect of Combined Addition of Microalloy Elements on Low C-Mn Steel ............... (259)
Bai Yuguang, Gao Qiang, Zhang Lianwei, Li Chunshang, Sun Zhengyun, Wang Tieli
Modelling of Austenite Decomposition Kinetics in Nb Steel During Run-Out Table Cooling

R. Pandi, M. Militzer, E. B. Hawbolt and T. R. Meadowcroft

Prediction of the Ferrite Grain Size in Low Carbon Steels

M. Militzer, E. B. Hawbolt and T. R. Meadowcroft

An Experimental Study on Hydrogen Diffusion Behaviors in Stress Fields

Quan Gaofeng, Song Yujiu

Hairline Cracking in Low-Carbon HSLA Steels

Cao Yinzhi, Yao Weixun

Bauschinger Effect and Yield Ratio of The M-A Structure

Ma Maoyuan, Song Wei and Xi Huizhi

Service Induced Temper Embrittlement in A Series of High strength Low Alloy. HSLA Bolting Steels—The Influences of Grain Size, Phosphorus Content and Accumulated Strain

J. H. Bulloch

Dynamic Fracture Toughness of the Steel HQ80

Zhang Wanshan, Tang Guoyi, Hu Youxin and Qin Ruikai

Interpolation Model for Determination of the Mechanical Properties of Steels in Dependence on Composition and Heat Treatment

B. B. Vinokur

Process Metallurgy

Study on Hardenability of 20MnVB Steel Smelted With Converter or Open-Hearth Process

Xu Hongxin and Li Wenqing

Effect of Smelting and Casting Process on the Form and the Distribution of Ti in V-Ti-N Microalloying Steel

Guo Jingru, Sun Yubin, Lin Zhihua, He Guangzuo and Tan Zhen

Modelling Studies in Continuous Casting of Steel

A. Pratap Singh, R. Asthana and M. Sisodia

Experimental Study on Deformation Resistance of Low Alloy Steels in Multi-Pass Hot Rolling

Chen Zhentao, Qiao Kebin, Lin Na, Ren Ziping and Feng Yaxuan
Strengthening of a V-Bearing Microalloyed Steel in Hot-Rolling and Accelerated Cooling Conditions ................................................................. (326)
Wang Zhaodong, Wang Guodong, Zhang Qiang, Zhang Xiaofang, Wu Guoliang, Ma Dongqing

The Influence of Various Processes on Steel Homogeneity ........................................ (331)
L.F. Vigodner

Effect of Air Cooling on Microstructure and Tensile Properties of a Low Carbon Mn-Nb-Ti Steel ......................................................... (337)
Xu Likun, Yang Dezhuang

The Influence of Temperature Oscillations on the Hot Ductility of Ti Free and Ti Containing Steels ......................................................... (342)
B. Mintz, R. Abushosha, S. Ayyad and G.I.S.L. Cardoso

Mechanism and Prevention Method of Grain Coarsening in Seamless Rolling Process ...... (346)
H. Asahi, M. Ueno and A. Yagi

Effects of Reheating Temperature and Cooling Rate on the Microstructure and Mechanical Properties of BHS-1 Steel ........................................... (352)
Dong Wenpu, C. I Garcia, A. J. DeArdo

Laboratory Casting Simulation and Carbonitride Characterisation of a Ti-Nb Microalloyed steel ................................................................. (357)
R. Gjengedal, J. K. Solberg and Liu Xiaodong

The Effect of Rolling Technology on Mechanical Properties of 14MnVTiRE Strip Steel .... (363)
Tian Qibin, Bai Chenghui and Yang Xiyan

Plastometric Determination of HSLA Steels Hot Working Characteristics in Vitkovice ...... (367)
J. Boruta, I. Schindler, P. Szaturc and M. Liska

Sheet, Strip and Plates

Development of HSLA and Microalloying Steels at Anshan Iron and Steel Complex .......... (373)
Lin Ziquan, Zhang Xiaogang and Hao Sen

Application of HSLA Sheet Steels to Automotive Industry in China ............................ (377)
Tan Shankun, Yao Guisheng, Gong Zhijian and Zheng Wandong

Extended Application of TM Plates due to New Process Development .......................... (384)
A. Streisselberger, W. Schutz, J. Bauer, R. Hubo and F. E. Hanus
Microalloyed High Strength Weldable Steel 15MnVN and Its Application on Jiujiang Yangzi River Bridge ....................................................... (393)
Cui Feng, Pan Jiyan and Fang Qinhan

Hot Strip Mill Process Control to Improve Yield Strength Uniformity in a 550 MPa Yield Strength Hot-Rolled Steel Sheet ................................................. (397)
Z. Yao, B.K. Zuidema, P.D. Peiffer, T. Kremm, S. Mukavitz and K. Dangelmaier

Effect of Ti Content on Mechanical Properties of Hot-Rolled Strip Steel ..................... (403)
Yang Caifu, Zhang Yongquan, Liu Tianjun, Sun Zhixin

Laboratory Research on Controlled Rolling and Controlled Cooling of Pipeline Steel ........ (407)
Li Huxing, Chen Yihong, Zhou Cheng, Cheng Qingwu, Ge Maoqi, Cheng Xiaoru, Zheng Lin,
Luo Dexin, Wen Aqing and Luo Gang

Study on High Temperature Deformation Resistance of Pipeline Steel X65 .................... (414)
Cheng Xiaoru, Ge Maoqi, Chen Yihong, Zhou Cheng, Li Huxing, Luo Dexin, Zheng Lin,
Wen Aqing and Luo Gang

Determination of Thermodynamic Properties in Low Alloyed Steels .......................... (419)
K. J. Lee, J.K. Lee, K.B. Kang and O. Kwon

Influence of Accelerated Cooling on Mechanical Properties of Steel 10CrSiNiCu ............. (425)
Liu Tianjun, Liu Wuqun, Zhang Yongquan, Yang Caifu

Development of High Strength Steel Sheets for Automotive Panels by Continuous Galvanizing ............................................................... (429)
Young-Min Choi, Yong-Hun Lee, Jea-Ryun Jeong

Seamless Pipe, Rod, Bar, Forgings and other Long Products

Development of a Mo-B-Ti Type High Toughness Wire for Pipelines .......................... (437)
Xu Zuze, Jin Shilin, Yao Xiren and Tian Xiuting

Experiences in Production of Micro-Alloyed Steel at Pakistan Steel .......................... (443)
Muhammad Moinuddin Ali Khan

Development of Non-Heat-Treated Microalloyed Steels for Oil-Sucker Rods ................... (446)
Qi Changfa, Wu Shilin, Du Ye, Wang Yunge

Effects of Manufacturing Conditions on Mechanical Properties of Quench Hardened Ultra-
High Strength Hot Rolled Steels ......................................................................... (451)
S. H. Park, K.H. Kim and W.Y. Choo

Machinability Improvement of Microalloyed Medium Carbon Steel ............................ (458)
Wang Ruizhen, Cai Aiguo, Pang Ganyun, Zhang Hongtao
Characteristics of Critical Automotive Parts Achieved by Direct Cooling of Medium Carbon Microalloyed Steels With and Without Boron ..................................................... (462)
F. Penalba, M. Larrea, M. Carsi, I. Rieiro and F. Zapirain

Effect of V-Ti Microalloying on Anti-Seismic Properties of Building Structural Steels
...................................................................................................................... (458)
Gong Shihong and Sheng Guanmin

Development and Application of Accelerated Cooling Plant for Seamless Steel Tubes ... (474)
Wang Shijun, Zhou Xudong and Liu Chuan

Characterization of Medium Carbon Microalloyed Steels with V,Ti,B ........................ (477)
M. Carsi, F. Penalba and C. Garcia

Study on Application of RE in J55 Steel ............................................................. (480)
Yu Zongsen, Chen Ning, Lin Qin, Ye Wen, Yao Tingjie

The Investigation of Rare Earth Rail .................................................................... (484)
Jia Guoping and Fang Hualong

Microalloyed High Carbon Pearlitic Rail Steels ................................................. (489)
P. Y. Wang, V. Jerath and D. V. Edmonds

Bainitic, Dual-Phase and TRIP Steels

New Type High Strength Low Alloy Meta-Bainitic Steel ................................. (495)
Kang Mokuang, Jia Husheng, Liu Xiao, Yang Yanqin, Yang Dongfang and Wu Xiaolei

The Research and Development of a Hot-Rolled Ferrite-Bainite Sheet steel ........ (500)
Huang Chunfu, Pang Ganyun, Chen Hongju, Zhang Hongtao, Zhang Yongjia, Wang Zhensheng

Potential of Directly Treated Bainitic High Strength Forging Steels ..................... (507)
J. Bellus, P. Jolly and C. Pichard

A Study of the Cold-Rolled Dual-Phase Steel Annealed in Bell Type Furnace .......... (513)
Wang Mingwei, Zhang Jiuxin and Tan Dianlong

Warm Stretch-Flangeability of High Strength TRIP-Aided Dual-Phase Sheet Steels
.................................................................................................................. (520)
A. Nagasaka, K. Sugimoto and M. Kobayashi

Manufacture of As-Rolled High Strength Bolts Using Hot Rolled and Control Cooled Dual-
Phase Wire Rods ......................................................................................... (526)
Song Lan, Pang Qianxiang, Zhang Shizhong and Liu Yingjian

Sympathetic Nucleation Ledgewise Growth of Bainite in Steels ............................. (530)
Fang Hongsheng, Wang Jiajun, Yang Zhigang, Hu Daxin and Zheng Yankang
Microstructure and Toughness of HAZ in an Ultra-Low Carbon Bainitic Steel Containing Boron

Tan Dianlong, Zhang Shanhong, He Xinlai, Yu Zongsen, Ke Jun (T.Ko)

Corrosion, Fracture, Weldability and Miscellaneous

Weldability Considerations in the Development of Structural Steels

K. Hulka and F. Heisterkamp

Artificial Intelligence (AI) Approach to the Corrosion of HSLA Pipeline Steels in Sour (Environments) Oil-Fields

C. O. Emenike

The Influence of alloying Elements on Corrosion Resistance of Low Alloy Corrosion Resistant Steels

Jiang Shizheng, Tong Deqing, Han Junyuan and Zhang Baoling

Microstructural Effects on the Sour Gas Susceptibility of an API X-80 Steel

H. F. Lopez, J. L. Albarran, L. Martinez

Effects of Alloy Chemistry on Mechanical Properties of Copper-Bearing HSLA Steels and Weld Heat Affected Zone Evaluation


Effects of Different Welding Heat Input on Impact Toughness of Simulated Weld Coarse Grain Zone for Steel DG50

Ao Liege

Niobium-Determining Factor in Intercritical Normalizing of Steels Used for Welded Constructions

F. I. Sandu, V. Munteanu, D. T. Levcovici

Effect of N on Toughness of HAZ of Nb-V-Ti Microalloyed Steel

Peng Yun and Xu Zuze

Development and Practical Application of Fire-Resistant Steel for Buildings

R. Chijiwa, H. Tamehiro, A. Yoshie, K. Funato, Y. Yoshida, Y. Horii and R. Uemori

A Mathematical Model for Carburization of Steel 20CrMnTi

Zhao Xuerong, Cao Li, Zhou Guangying

The Phase Model of Production for process Description and Process Analysis Focused on Quality Assurance

Lauber, J., Polke, M.