4TH INTERNATIONAL CONGRESS ON HEAT TREATMENT OF MATERIALS

JUNE 3-7, 1985 - BERLIN

PROCEEDINGS Volume I

**Microstructure and Properties**

1. Morphology of Martensite

*G. Krauss*

…………………….0.1

2. Kinetics of Isothermal Automatization Process in the Intercortical

Temperature Range of Low Carbon Alloy Steel

*T.C. Lei, J. Pan*

……………………. 1

3. Zur thermischen Restaustenitstabilisierung bei dem hcchlegierten

Werkzeugstahl X 210 Cr 12

*H.Schwendemann, H.Muller, O.Vöhringer, E.Macherauch*

……………………. 15

3. On the Effect of Grain Size on the Ms-Temperature of Fe-C-Ni-Alloys

*J. Pietikginen*

……………………. 26

4. An Investigation of the Bainite Transformations in Fe-Ni-C- and

Fe-Si-C-Alloys

*Chengji Li, G.R. Purdy*

……………………. 32

5. Bainite Transformation in Si-Mn-Mo-V-Steels

*Gu Quan-Cheng, Yang Rang*

……………………. 47

6. The Numerical Method for Mathematical Treatment of TTT-Curve and

its application

*Gou Wen-Li, Yao Gou-Zi*

……………………. 60

7. Hardenability: An Alternative to the Use of Austenitic Grain Size as

Calculation Parameter

*M.P. de Andres, M. Carsi*

……………………. 70

8. Prediction of the Macro-Hardness by Help of the Individual 84

Hardness of the Microstructural Elements

*S. Somogyi, M. Gergely*

……………………. 84

9. Innere Reibung bei den Martensitumwandlungen in Fe-20Ni- und

Fe-12Mn-Legierungen

*I.M. Parsharov, M. Weller*

……………………. 91

10. Theoretische und experimentelle Untersuchung der

Eigenspannungen in kontinuierlich und diskontinuierlich

abgeschreckten Zylindern aus 42 CrMo 4

*P. Graja, H. Muller, B. Scholtes, E. Macherauch*

……………………. 100

11. The Investigation of the Ageing Process and α-γ-α-Transformation

in the Maraging Steel of Fe-Ni-Co-Mo-Ti-Type

*N.Vidojević, N.Novocić -Simović, M.Rogulić, B. Andjellć*

……………………. 124

12. Influence of Hot-Deformation on Morphology and Effective

Grain Size of Lath Martensite in 18Ni Maraging Steel

*C.K. Yao, Z. Xu*

……………………. 132

13. Effect of Chromium and Microstructure on the Bending Fatigue of

0.75Mo-1.8Ni-0.80C Steels

*J.B. Kelley, G. Krauss*

……………………. 147

14. The Low Carbon High Strength Martensitic Steel (rues.)

*J-.A. Bashnin, V.K. Galkin*

……………………. 164

15. Formation de Graphite Spheroidal par Recuit de Graphi-tisation

de la Matrice Bainitique d'une Fonte G.S.

*J.P. Chobaut, J. Saverna, J.M. Schissler*

……………………. 169

16. Structure and Morphology of Interstitial Phase in Secondary Hardening

Steels

*Ju.I. Ustinovshikov*

……………………. 180

17. A Study of Modified Martempering of Ball Bearing Steel

*Xu Zuoren, Xu Guoying, Yu Jinxing*

……………………. 202

18. A New Exploration of Strengthening and Toughening Heat Treatment

of 40 Cr Steel

*He Zerong*

……………………. 214

19. Influence of Chemical Composition, Heat and Chemical Heat Treatment

Regimes of Hot-Work Tool Steels on Thermal Fatigue Resistance (cuss.)

*V. Mitchev, B. Sokolanski*

……………………. 233

20. The Role of High-Temperature A-Ferrite in the Precipitation of

Intermetallic Phases in Chromium-Nickel-Molybdenum Steels

*E. Szpunar, J. Bielanik*

……………………. 244

21. The Studies of Forging-Quenching on Automobile Heavy

Forging Components

*Y.S. Yao, H.Y. Chen, S.C. Lu, B.S. Chang*

……………………. 255

22. Influence of Substructure and Flow Stress of Ausformed Austenite

on Strength of Ausformed Martensite

*Z. Xu, C.K. Yao*

……………………. 272

23. A Phenomenological Description of the Austenite-Martensite

Transformation in Case-Hardened Steels

*E. Furedi, N. Gergely*

……………………. 291

24. Study of Strength and Toughness of 18Cr2Ni4W Steel with

the Structure of Intermediate-Temperature Transformation Products

and their Mixed Structures with Martensite

*Yu Degang, Zhen Jinghong, Liang Zhenfeng, Shen Fufa*

……………………. 302

25. Diffusional Transformation Kinetics from Austenized

Recrystallized Austenite

*Y.M. Zhang, X.Y Men, S.Q. Zhang, C.K. Yao*

……………………. 318

26. Influence of Metal ease Type, Shape of Graphite Inclusions

and Chemical Composition of Cast Irons on Thermal Fatigue Resistance

*B.M.Sokolanski, B.S.Mitchev, A.T.Levkov, D.M.Semkov*

……………………. 329

27. An Approach for Calculation of M in Multicomponent Steels and

its Application to Heat Treatment

*Li Lin, T.Y. Hsu*

……………………. 343

28. The Growth of Austenite Grain

*Qi Zhengfeng, Wang Yuanzhu, Gao Hang, Wang Chunya*

……………………. 353

29. Internal Friction Studies on the Aging of Fe-18Ni-0.8C Martensite

*J. Ullakko, J. Pietikäinen*

……………………. 361

30. Cellular Reactions at the Early Stages of Ageing in Zinc-Aluminium

Based Alloys

*Yao-Hua Zhu, S. Murphy*

……………………. 367

31. Optimierung der chemisdhen Zusarmiensetzung des X40CrMoV51

im Hinbblick auf die Hartbarkeit und Zahigkeit

*H. Berns, F. Wendt*

……………………. 378

32. The Recrystallization Behaviour of Austenite in the Reheating

Cycle of Quenched M2 High Speed Steel, and the Formation

of the Fish-Scale Fracture and its Elimination

*Gu Nanju, Yen Dianyan, Xu Bojun*

……………………. 392

33. An Investigation of Eliminating the Reversible Tempering

Embrittlement of Steels by 1HT

*Wang Chuanya, Ding Zhimin, Xu Xiang*

……………………. 418

34. EinfluIB der WärmebehandlunE auf das Ermudungs-vernalten

ledeburitischer Kaltarbeitsstühie

*H. Berns, W. Ttojahn*

……………………. 427

35. Effect of La on the Isothermal Embrittlement of P-doped Ni-Cr Steel

*Yang Yishi*

……………………. 439

36. The Influence of the Microstructure of Martensite and Bainite on the

Toughness of the Tool Steel for Forging Dies

*He Shiyu, Feng Xiazeng, Gao Susan*

……………………. 446

37. Determination of the Residual Elastic Micrnstrain in Al-Cu-Alloys

*V. Sijacki-Zeravcic, M. Rogulic, V. Milenkovic*

……………………. 456

38. Numerical Study of Phase Changes, Current and Residual

Stresses at Quenching Bodies of Complex Configuration (cuss.)

*N.I. Kobasko, V.S. Marganjuk*

……………………. 465

39. Distribution Functions of Thermal and Structural Residual Stresses

in Cylindrical Parts

*Kang Datau, Mang Hai, Nan Uen*

……………………. 487

**Surface Hardening**

1. Ein allgemeines mathematisches Modell zur Beschreibung

thermochemischer Prozesse

*H.U. Fritsch, H.W. Bergmann, H. Gerdes*

……………………. 504

2. A Mathematical Model and Computing Method for the Prediction of

Technological Parameters of Two-Stage Carburizing in Fluid-Bed Furnaces

*T.Reti, F.Petrich, M.Cseh, F.Burista, Z.Kolzsvary, M.Barabassy*

……………………. 520

3. Cementation acceleree par corrmande numeriques des fours

*G. Prunel, J.P. Benchetrit*

……………………. 531

4. Controlling Variables which Affect the Tempering of Carburized Gears

*D. Rosenblatt*

……………………. 543

5. Erfahrungen mit der rechnergesteuerten Tropfbegasung beim

Gasaufkohlen in Mehrzweckkammeraifen

*D. Grassi, B. Edenhofer, U. Wyss*

……………………. 562

6. Perspectives of Development Low-Temperature Nitriding of Parts

*J. M. Lachtin*

……………………. 583

7. Equilibrium and Non-Equilibrium Models of Layers Formation

During Ion Gas Nitriding

*A. Marciniak*

……………………. 591

8. The Dimensional Stability of Ion-Nitrided Nitralloy

*She-fang Du*

……………………. 609

9. Ion Nitriding of Steel and Titanium at Low Pressures

*J.M.Molarius, K.U.Salmenoja, A.S.Korhonen, M.S.Sulonen, E.O.Ristolainen*

……………………. 625

10. The Principle and Technology of Ion Carburizing and Carbonitriding

*Han Li-min, Li Chun-yang, Chang Yong, Ma Deng-jie, Chen Min-xiong*

……………………. 644

11. A Mathematical Model for Predicting Nitrogen Concentration Profile in

Gas Nitriden Steel

*V.C. Anchev, V.S. Simeonov*

……………………. 663

12. Zähigkeit von Nitrierschichten auf Eisenwerk-stoffen and ihre

Kennzeichnung

*H.-J. Spies*

……………………. 681

13. Ablauf der Ermaiung in randschichtgehLrteten Bauteilen

*H. Berns, L. Weber*

……………………. 691

14. Residual stresses and microstructures in laser hardened medium and

high carbon steel

*P. Ericson, Yao Shan Chang, M. Melander*

……………………. 702

15. The Laser Hardening of Ring Grooves in Medium-Speed Diesel

Engine Pistons

*A.S.Bransden, S.T.Gazzard, B.C.Inwood, J.H.P.C. Megaw*

……………………. 734

16. Corrosion Behavior of Carbon Steels Treated with Power Laser

*P. Matteazzi, L. Giordano, M. Magrini, A. Zambon* ……………………. 749

17. Der Einflu9 passivierender Schichten aus vorgeschalteten

ArbeitsvorOngen auf den Ablauf thermochemischer Diffusions-prozesse

*A. Schreine*r

……………………. 758

18. Ion Surface Alloying

*Zhong XU, F.Y. Gu, Z.M. Wang, J.D. Pan, W.N. Zheng, T.H. Han, B.H. Fan*

……………………. 785

19. Application of Low Frequency Induction Hardening to the

High Hardness-Deep Hardness Penetration Rolls

*M. Fukushima, A. Hoshi, K. Akahori*

……………………. 809

20. The Investigation and Application of LT Process

*Hu Yizhen, Zu Qing, Yuan Xianchun*

……………………. 830

21. Mechanical Properties of Ion Carbonitrided Layers and

Comparison with Conventional Gas Carbonitrided Layers

*Xia Lifang, Lu Yuyan, Guo Xiuwen, Yu Hongyan*

……………………. 845

22. Effect of the Activity of Rare Earth Elements on Carbonitriding Process

*Y.D.Wei, Z.R.Liu, C.Y.Wang, X.H.Cheng, S.Y.Li, G. Cheng*

……………………. 858

23. Effect of Deformation-Nitrocarburizing combined Treatment

on Mechanical Properties of Fe-0.08 C Steel

*Liu Zhi-ru, Meng Xiang-cai*

……………………. 867

24. Influence of the Nitrided Layer Structure and Surface Pressures

on its Wear Resistance by Friction

*T. Burakowski, J. Senatorski, J. Tacikowski*

……………………. 874

25. Nitrititanieren and Nitrieren von Werkzeugen aus Schnollarbeitsstahl

*L. Foldvary, Z. Nemeth*

……………………. 885

26. Comparison of Properties of Nitriding and Oxy-Suipho-Nitriding

Diffusion Layers in Gaseous Thermo-Chemical Treatment

*K. Szczecinski, M. Wysiecki*

……………………. 896

27. Forschung nach neuer Technologie des Borierens auf galvanischer

Kobaltschicht

*Tang Ze-yi, Yang Yu-Xiong*

……………………. 906

28. A Few Aspects of Layer Formation in Plasma Borcnizing

*E. Filep, S. Farkas, Z. Kolozsvary, D. Biro*

……………………. 925

29. Plasmanitrieren von Zahnrliern in der Serienfertigung

*A. Roelandt, J. Elwart*

……………………. 940

30. The Research of Transformation During Heating by Laser

*An Shimin, Wang Ru, Qi zhengfeng*

……………………. 952

31. Chemisches Gleichgewicht oder Ungleichgewicht bei

Aufkohlungsatmospharen

*C.H. Luiten, H.J. Grabke, W. Gohring*

……………………. 970

32. Stand der Anwendung von mathematischen Modellen bei

Gasaufkohlungsprozessen

*M. Stupnisek*

……………………. 978

33. Anticarbonizing Diffusion Barrier in High-Alloyed Cast Steel Fe-Cr-Ni

*M. Wysiecki, P. Christodulu*

……………………. 987

34. Middle-Carbon Case-Hardening High-Speed Steel

*J.Wyszkowski, J.Szyska, W.Panasiuk, W.Szatkowski*

……………………. 999

**Surface Layers**

1. Surface Engineering of Titanium with Nitrogen

*T.Bell, H.W.Bergmann, J.Lanagan, P.H.Morton, A.M.Staines*

…………………….1008

2. Investigation on TIC-Protective Coating on Iron Base Alloys by

Powder Pack Method

*K. Yoshida, M. Kawakami*

……………………. 1033

3. Titanium Diffusion Coating by the Pack Process: Effect of Diffusion

Mixture on the Microstructure

*S. Hirai, S. Ueda*

……………………. 1044

4. Effect of Subsequent Heat Treatment on the Adhesion and

Properties of Ion Plated TiN-Coatings

*A. Korhonen, J. Pimia, M. Sulonen*

……………………. 1074

5. Mechanical Characteristics of TiN, TiC Coatings Using PVC and CVD

*J.P. Peyre, F. Rohart, J.J. Tessier*

……………………. 1085

6. Practical Experience of Using Chemical Vapuor Deposition

Coatings to Resist Wear, Corrosion and Oxidation

*A.Kempster, C.C.Hanson, J.R.Smith*

……………………. 1094

7. Carbide Coatings in Molten Borax Bath - Growth Mechanism of

Layer, Properties and Application

*H. Fujita, T. Arai*

……………………. 1109

8. Diffusion Annealing

*P. Miller, E. Ravnborg*

……………………. 1255

9. Das Verzinkan von Stahldraht direkt von der Temperatur des

Rekristallisations Schnellglijhens

*J. Szota, L. Cieslak*

……………………. 1144

10. On the Production Possibilities of a Hot Dip Galvanized Dual-Phase Steel

*S. Makimattila*

……………………. 1154

11. Boron Aluminizing by Pasty Agent

*Zhang Zhengxin, Li Fengzhen*

……………………. 1169

12. Morphology of the Diffusion Layers in the Hot Dip Galvanized Steel Wires

*J. Szota*

……………………. 1177

13. The Layer-Assisting Toughening and Strengthening-Toughening Treatment

*Xu Shou-lian, Wang Ji-ru, Jin Tian-fu*

……………………. 1183

**Energy, Cooling**

1. Economy - Efficiency - Energy Saving in a Modern Heat-Treating Unit

*I. Montevecchi*

……………………. 1200

2. Technological Energy Consumption of Heat Treatment of Gears

*T. Burakowski, A. Sala, A. Wozniak*

……………………. 1214

3. Economy of the Resources for Heat Treatment in Electrical Furnaces with Controlled Atmospheres

*V.D. Artemejev, M.N. Leonidova, J.J. Maegrois, V.A. Revsin, V.J. FilippoV*

……………………. 1234

4. Wirkung der Gasatmosphren auf das GefEige verschiedener Werkzeugstaile

*C. Beguin, A. Kulmburg, J.P. Guignard, J.M. Rufer*

……………………. 1138

5. Polymer Quenchants: Evaluation of Technical and Environments Properties

*S. Segerberq*

……………………. 1254

6. Microcomputer-gestutztes Sonde-Etalon-Verfahren zu Messung

der realen AbschreckintensitR und zu Vorausbe-stimmung

der Harteverteilung am Rundquerschnitt beim Harten

*B. Liscić, T. Filetin*

……………………. 1266

7. Accelerated Cooling of Steels and Cast Irons in a Fluidized Bed

*R. Pulkkinen, J. Virta*

……………………. 1284

8. The Cooling Characteristics of Fluidized Bed and its Application for Quenching of Steels and Aluminium Alloy

*Zhou Rulin, Huang Genlian*

……………………. 1293

9. New Process for Gas Chromizing and Quenching

*N. Kanetake*

……………………. 1320

10. Werkstoffspezifische, anwendungstechnische und bkolo-gische

Fragen in der modernen Armebehandlungstechnik

*K. Leban*

……………………. 1346

11. Fluidized Bed Heating for Hardening of Files

*F.Burista, F.Petrich, Z.Rogalski, Z.Obuchowicz*

……………………. 1363

12. Investigation of Nitrogen-Based Protective Atmosphere in

High Temperature Fluidized Bed Furnaces

*Zhao Ai-mei, Yang An-jing*

……………………. 1374

13. Laser Thermochemical Treatment of Metals and Alloys (rues.)

*J.D. Kogan*

……………………. 1393

14. Heat Treatment as one of the Stimuli of the Energy

Consumption Decrease in Industry

*A. Sala, T. Burakowski*

……………………. 1403

15. The Economizing on Energy of Ion Thermochemical Treatment

*Xia Lifang, Lu Yuyang*

……………………. 1422

16. Plasmacarburieren, seine wissenschaftlichen, technischen

und betriebswirtschaftlionen Aspekte

*F. Hornbeck, W. Remhges*

……………………. 1430

17. The Progress of the Ton Thermochemical Treating Furnace

*Xia Lifang, Lu Yuyan, Guo Xiuwen, Yu Hongyan, Wang Shouzi, Yu Hintai*

……………………. 1440

18. Effect of High Temperature Rolling on Microstructure and Properties of High-Speed Steel CW9Mn3Cr4VN

*Z.R. Liu, S.C. Qi, P.X. Cheng, S.M. Song, G.Z. Pan, T.C. Lei*

…………………….1445

19. Homogenization Heat Treatment and the Hot Workability of the ingots of Al-Mg-Alleys

*M.M.Sultan*

……………………. 1458