

11th Congress of the International Federation for Heat Treatment and Surface Engineering

4th ASM Heat Treatment and Surface Engineering Conference in Europe

Final Programme

Organized for IFHT and ASM-Europe Council by AIM - Associazione Italiana di Metallurgia

Introduction

Applications of metal components are strongly affected by bulk and surface treatments. Innovation and studies on the matter have formed the subject of IFHT Congresses around the world since 1981; in 1996, IFHT and ASM Europe combined their programmes into one event in Brighton, England. Now, in Florence, this joint approach is being used again to offer maximum efficiency for all participants. The two organizations have joined forces with AIM to gather in Florence all the people from science, research and industry who are at the leading edge of the field. By analyzing and comparing results of most recent studies it will be possible to obtain an in-depth perspective of future developments for an outlook to the next beginning millennium. Thus IFHT, ASM Europe and AIM are pleased to invite all those interested at the joint 11th Congress of IFHT / 4th ASM Conference on Heat Treatment and Surface Engineering. Florence will provide a wonderful cultural backdrop to the scientific and technical discussions and collaboration which will emerge from the 5 plenary and 15 technical sessions that are planned in the highly focused programme.

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I. Montevecchi - Bioteco Segrate, Italy

G. Palombarini - Universita di Bologna, Italy

J.M. Prado -Technical University of Catalonia, Spain

E. Stagno - Universita di Genova, Italy

Chairman

- Ing, Italo Montevecchi

Vice-Chairmen

- Dr. Paolo Luca Antona
- Prof Donato Firrao
- Prof. Eric J. Mittemeijer

Morning

9.00

Registration of delegates

10.00

Welcome Address of the Chairman Italo Montevocchi

Welcome Address of the AIM President Luigi Iperti

Welcome Address of the IFHT President Zoltan Kolozsvary

Welcome Address of the ASM Europe President Timo Kekkonen

11.00

LAKHTYN Lecture

T. Bell - University of Birmingham United Kingdom and a Representative of Russian Metallurgists Association

11.45

Exhibition Opening

Afternoon

14.15

Plenary and Technical Sessions

Evening

20.00

Gala Dinner Awarding of the best PhD student contribution prize offered by UNITT - Unione Nazionale Industrie Trattamenti Termici, Italy

Plenary Session

Chairman: D. Firrao

14.15

Keynote speaker

Internal nitriding of iron alloys; role of Cr, Al and Si

E. J. Mittemeijer - Max Planck Institute for Metals Research Stuttgart, Germany

M. H. Biglari - Delft University of Technology, The Netherlands

M. A. J. Somers - The Technical University of Denmark, Lyngby

Session: Nitriding/Carburizing

Chairman: P.L. Cavallotti

14.45

Effects of the pretreatment in reactive gases on the gas nitriding process of steel alloys

M. Stiles, B. Haase, J. Dong, T. Haasner - Stiflung Inst. für Werkstof. Bremen Germany

Influence of microstructure on the fracture behaviour of hot working tool steels nitrided layers

D. Firrao, M. Rosso, G. Scavino, G. Ubertalli - Politecnico di Torino, Italy

Improving the properties of austenitic stainless steels by surface engineering

P.F. Stratton, E. Chang, W. Huang - Boc Gases Sheffield, United Kingdom

Layer formation, growth kinetics and hardness profiles on high temperature gas nitrided steels

R. Schneider, H. Hiebler Montanuniversitat Leoben, Austria

16.05 coffee break

16.35

Nitrided layers nucleation and growth problems

J. Ratajski, R. Olik - Techn. University of Koszalin, Poland

J. Tacikowski - Inst. of Precision Mechanics Warsaw, Poland

Verification of the development of reaction layers and their effect on thermochemical processes

T. Haasner, B. Haase, A. Walter, M. Stiles - Stiftung Inst. für Werkstof. Bremen, Germany

Wear properties of gas-sulphonitrided stainless steels

S. Anzawa, H. Takizawa - Industr. Res. Inst. Nagano Prefecture, Japan H. Nomura - Matsuyama Giken Maruko, Japan K. Sugimoto, M. Kobayashi - Shinshu University Nagano, Japan

Morphology and properties of phospho-nitrided layers

J. Nowacki - Technical University of Lodz, Poland

Session: Bulk Heat Treatment

Chairman: G. Krauss

14.45

The effect of silicon content on the impact energy and transformation kinetics of austempered ductile iron

J.M. Mallia, M. Grech - University of Malta Msida

R.E. Smallman - University of Birmingham, United Kingdom

Influence of elastic stress of ledge/dislocations on growth kinetics of precipitate plates

Z.G. Yang - Tsinghua University Beijing, China

M. Enomoto - Ibaraki University, China

Optimized heat treatment of die-casting dies

O. Sandberg, B. Klarenfjord - Uddeholm AB, Sweden

Heat treatment of high chromium cold work tool steels and high-speed steels in the vacuum furnace

H. Jan, H.P. Fauland, G. Pockl, H. Lenger - Bohler Edelstahl Kapfenberg, Austria

16.05

coffee break

16.35

An analysis of the production and applicability of austempered ductile iron and alloyed as-casting bainitic ductile iron

F. Cajner - University of Zagreb, Croatia J. Mrsa, B. Smoljan - University of Rijeka, Croatia

Effect of austenitizing parameters on the change of concentration of alloying components and phase structure of tool steel of type 2% C and 12% Cr with additives of W, Mo, V

T. Nykiel, T. Hryniewicz - Techn, Univ. of Koszalin, Poland

Effect of addition 0.8% Cu & 0.8% Ni on some metallurgical properties of ductile cast iron on austempering

A.A. Nofal, O.A. El-Shahat, M.M. Murad - CMRDI Helwan Cairo, Egypt

Heat treatment effect on carbide reactions in 15Cr5Mo steel

G.D. Pigrova - Central Boiler and Turbine Inst. St. Petersburg, Russia

V.M. Sedov - Lenneftchim St. Petersburg Russia

Session: CVD I PVD

Chairman: D. Franchi

14.45

Thick coatings deposition on aluminum alloy by CDS process

A. Zambon, E. Ramous, B. Badan - Universita di Padova, Italy
M. Bianco - RTM Vico Canavese, Italy

Interdiffusion during CVD-coating of steels: influences on structure and properties

O. Ke0er, F. T. Hoffmann, P. Mayr - Stiftung Inst. fur Werkstofftechnik Bremen, Germany

TiAlN universal coatings for high speed and dry machining

H. Curtins - Platit AG Grenchen, Switzerland D. Franchi - T T. Ferioli & Gianotti Caselette, Italy

Low friction, auto-lubricant, soft coatings for cutting tools, dies and mechanical components

J. Rechberger - Vilab SA Berna, Switzerland F. Rabezzana - Metec Torino, Italy

16.05 coffee break

16.35

Characterization of 10 μm thick TiN and CrN coatings for severe applications

S. De Rossi, S. Luridiana - Istituto Scientifico Breda Milano, Italy

Microstructural evolution in the PVD coating of HSS tools

F.

Miani, E. Kuljanic - Universita di Udine, Italy
A. Zambon, M. Magrini - Universita di Padova, Italy
L. Solari - Stark Trivignano Udinese, Italy

Coating of NiAl having various compositions on Ni3Al and Ni by means of chemical transportation technique

M. Kato, T. Suzuki - Kogakuin University Tokyo, Japan
H. Sasano - National Research Institute for Metals Tsukuba, Japan

PACVD deposition of diamond like carbon coatings: analysis of internal stresses

L. Nobili, G.L. Gobbato, F. Castelli, P.L. Cavallotti - Politecnico di Milano, Italy

PVD Deposition and characterization of Cu/Si (111) Cu/Ta/Si (111) multilayers

A. Z. Moshfesh, M. M. Shafiee, M. R. Ahmadi - Shanf Univ. of Techn. Tehran, Iran

Plenary Session

Chairman: E. Ramous

9.00

Keynote speaker

High speed steels and cold work steels by powder metallurgy

P. Hellman - Bohler Edelstahl GrnbH Kapfenbetg Austria

Session: Nitriding/Carburizing

Chairman: T. Bell

9.30

The influence of oxygen on the plasma nitrided and nitrocarburized layers

C. Ruset, V. Soica - National Inst. for Lasers Bucharest, Romania

S. Janosi, Z. Koloszvary - SC Plasmatern Tirgu Mures, Romania A. Bloyce,

T. Bell - University of Birmingham, England

High pressure nitriding of austenitic stainless steels

M. Jung, A. Walter, F. T. Hoffmann, P. Mayr - Stiftung Institut Werkstofflech. Bremen,

Germany P. Minarski - ALD Vacuum Technical Erlensee, Germany

Low pressure nitriding: the Nitral® process

S. Foissey, P. Jacquot, C. Deramaix, O. Atale - Innovatique Chassieu, France

Plasma nitriding of P/M ledeburitic tool steel

J. Suchanek, P. Jurci - Svum Prague, Czech Republic

10.50 coffee break

11.20

Ion composition of cathod area of glow discharge in ion nitriding

B. N. Arzamasov, T. A. Panayoti - Bauman Moscow State Technical University, Russia

A solution to improve the surface hardness of stainless steels without loss of their corrosion resistance

L. Poirier, Y. Corre, J. P. Lebrun - Nitruvid Argenteuil, France

Gas nitriding without chemical treatment of austenitic stainless steels

K. Hamaishi - Kagoshima Prefectural Inst. of Industrial Techn., Japan H. Sueyoshi - Kagoshima University, Japan

Plasma nitriding of aluminium alloys

B. Reinhold, H. J. Spies - Freiberg University of Mining and Techn., Germany

E. Naumann - Harterei-und Qualitätsmanagement Bohltz-Ehrenberg, Germany

Properties of aluminium alloys and AISI 3161, stainless steel nitrided in a new industrial reactor

N. Renevier - Balzers SA. Sausheim, France

N. Dingremont, P. Collignon - Balzers S.A. St. Thibault des Vignes, France

Session: Bulk Heat Treatment

Chairman: V.Lupinc

9.30

Heat treatment and fracture toughness of rolling bearing steels

R. Doglione, D. Firrao - Politecnico di Torino, Italy

R. Gariglio - Consultant Pino Torinese, Italy

Bainitic reaction kinetics determination by quenching dilatometry

H. Santos, S. Martins - Eng. School of Porto University, Portugal

Effect of a thermo-mechanical treatment on γ' morphology and creep behaviour of single crystal nickel base superalloys

M. Maldini, V. Lupinc - CNR-Tempe Milano, Italy

T. Yamagata, H. Harada - Nat. Res. Inst. for Metals Ibaraki, Japan

M. Yamazaki - Teikyo University Yamanashi, Japan

Polymer quenching technology: an overview

G. E. Totten, G. M. Webster - Union Carbide Corporation Tarrytown NY, Usa

10.50 coffee break

11.20

The evolution of gas quenching in today's heat treatment industry

B. Edenhofer, F. Bless, W. Peter, J. W. Bouwman - Ipsen International Kleve, Germany

Water-controlled cooling of AISI 52100 steel

E. Gariboldi - Politecnico di Milano, Italy

L. Zucchermaglio - Lentek Corsico, Italy

P. Davoli - Consultant, Italy

Development of cooling curve analysis standard with agitation - a status report

G. E. Totten, H. M. Tensi, B. Liscic Union Carbide Corporation Tarrytown NY, Usa

Cold chamber gas cooling for low pollution hardening

S. Sogerberg, E. Troell - The Swedish Institute of Product. Molndal, Sweden

Controlled heat extraction during gas quenching

B. Liscic University of Zagreb, Croatia T. Lubben, F. T. Hoffman, P. Mayr - Stiftung Institute fur Werkstofftechnik Bremen, Germany

Session: Laser Treatment

Chairman: R. Hoffmann

9.30

Improvement of corrosion fatigue limit of 12% Cr steel by shock laser treatment

G. Thauvin and all. - Gec Alsthom Belfort, France

Variable composition laser cladding. A novel approach for alloy design

A. Almeida, R. Colaco, R. Vilar - Institut Superior Tecnico Lisboa, Portugal

Wear resistant surface of irons and steels by laser alloying

M. Tsujikawa, M. Kawamoto - Osaka Prefecture University Sakai-shi, Japan M. Hino - Industrial Techn. Research Inst. of Okayama Prefecture Government, Japan.

Laser heat treatment of different types ledeburitic steels. A comparative study

P. Jurci - Svum Prague, Czech Republic P, Stolar - Faculty of Chem. Eng. Prague, Czech Republic

10.50 coffee break

11.20

Transformation mechanisms and deviations from local equilibrium during rapid austenitisation

J. Rodel - Dresden University of Techn., Germany

H.J. Spies - Freiberg University of Mining and Techn., Germany

Prediction of microstructure of the hardened zone in laser heat treated steels

I. Felde - Bay Zoltan Inst. Budapest, Hungary

T. Reti - Banki Donat Polytechnic Budapest, Hungary

Laser surface melting and wear behavior of a plastic mound tool steel

R. Colaco, C. Pina, R. Vilar - Instituto Superior Tecnico Lisboa, Portugal

Surface strengthening of nickel and its alloys by refractory titanium compounds

V.G. Tchernyi - National Academy of Sciences Kiev, Ukraine

Plenary Session

Chairman: A. Bavaro

11.15

Keynote speaker

A mathematical model for predicting temperature of steel during cooling based on

microstructural evolution

M. Suehiro - Nippon Steel Corporation Kitakyushu-city, Japan

Session: Nitriding I Carburizing

Chairman: J. P. Lebrun

14.45

Gas and plasma nitriding of (α+β) Ti alloy TiAl6V4 in different gas atmospheres and the influence of a following age-hardening treatment on mechanical properties

K. Wilsdorf, H.J. Spies - Freiberg University of Mining and Techn., Germany

Fracture properties of nitrided and nitrocarburized layers

M. Boniardi, M. B. Bozzini, G.C. Martinelli - Politecnico di Milano, Italy

Duplex treatment: applications of hard coatings combined to deep nitrided layers

V. Delaire, G. Prunel, B. Stauder - Thermi-Lyon Group, France

Surface hardening of 5Cr-1 1/4 Mo-1V die steel by using of diffusional dilution of Al thin film and plasma nitriding

S. Tsuji, T. Furusawa - Teikyo University Utsunomiya, Japan

16.05 coffee break

16.35

Enhancing the binding force between the hard coating and common structure steel by ion nitriding

Z. Hei, L. Wang, Y. Liu - Dalian Maritime University P.R., China

Fatigue characteristics of structural steels with plasma nitrided and lasered surfaces

P. Mazal, J. Stuchlik - Technical University Brno, Czech Republic I. Dlouhy - Czech Academy of Science Brno, Czech Republic

Oxinitrocarburizing process with post-oxidation

B. Grellet - Techniques Surfaces Andrezieux-Bouthéon, France

Oxidation of the nitrocarburised and nitrided surface layers: phase transformation and Fe₃O₄ /ε and Fe₃O₄ /γ' balance on the surface.

L.Torchane, Ph. Bilger, H. Michel, J. Dulcy - Ecole des Mines Nancy, France J.P. Peyre, D. Duchateau - Centre Technique des Industries Mecaniques Senlis, France

Session: Mechanical Properties and Engineering Applications

Chairman: **G. Palombarini**

14.45

Study on the contact fatigue behavior of limited hardenability steel

L. Li, L.P. Xu, Y.A. Min - Shanghai University, China R.H. Liu, M.H. Xu, J.P. Le - No.5 Steel Co. Shanghai, China

Fatigue strength of austempered ductile iron

M. Grech, A.L. Geraci, A. Risitano - University of Malta, Msida

Residual stress fields redistribution in shot peened 6063-T6 welded joint under fatigue loading

M. Beghini, L. Bertini - Universita di Pisa, Italy V. Fontanari, P. Scardi - Universitd di Trento, Italy

Microstructure and technological properties of the AISI H11 hot work tool steel

A. Molinari, G. Straffelini - Universitd di Trento, Italy R. Roberti - Universita di Brescia, Italy M. Pirovano - TTN Nerviano, Italy

16.05 coffee break

16.35

Effects of heat-treatment on structure and mechanical properties of Ni-P/B4C films prepared by autocatalytic chemical deposition

B. Bozzini, G. Giovannelli, P.L. Cavallotti, M. Boniardi - Politecnico di Milano, Italy

Age-hardenable plastic mould steels - influence of hardness and sulfur content on machinability

H. Schweiger, H.P. Fauland, H. Lenger - Baler Edelstahl Kapfenberg, Austria

Effects of second phase morphology on warm deep drawability of a trip-aided dual-phase steel sheet

A. Nagasaka - Nagano National College of Techn., Japan K. Sugimoto, M. Kobayashi - Shinshu University Nagano, Japan

Fracture toughness of high-speed steel measured in round notched and precracked tensile specimens

B. Ule, V. Leskovsek, B. Tuma - IMTLjubljana, Slovenia

Session: Modelling

Chairman: M. Suebiro

14.45

Shot peening parameters selection assisted by Peenstress software

Y. Le Guernic - Metal Improvement Company Amilly, France

An experimental numerical approach for the measurement of residual stress distribution in thermal sprayed coatings

M. Beghini, L. Bertini, F. Frenzo - Universita di Pisa, Italy P. Scardi - Universita di Trento. Italy

High precision numerical calculation of heat flow in semi-infinite solids by using dummy boundary

M. Fukushima - Hitachi Koki Hitachinaka. Japan

Simulation of steel hardening

M. Ehlers, H. Muller, D. Lohe - Karlsruhe University, Germany

16.05 coffee break

16.35

Prediction of microstructures and quenching residual stresses in case hardened pieces including selftempering effects

S. Denis, P. Auchambault, A. Simon - Ecole des Mines Nancy, France

C. Aubry, F. Ruckstuhl - PSA Voujeaucourt, France

B. Miede - CETIM Senlis, France

Simulation and experimental verification of residual stresses and distortion in a non-homogeneous quenching process

D.Y. Ju - Saitama Institute of Technology, Japan K. Ichitani, E. Nakamura - Idemitsu Kosan Co. Chiba, Japan

Application of generalized time-temperature parameters for the prediction of rapid austenitization processes

T. Reti, Gy. Bagyinszki, I. Czinege - Banki Donal Polytechnic Budapest, Hungary

Modelling of the surface layers constituted during hardening and nitriding processes

K. Skalski, G. Wroblewski - Warsaw University of Technology, Poland

Plenary Session

Chairman: E. J. Mittemeijer

Keynote speaker

Martensite in bulk and induction hardened steels. Are there differences?

G. Krauss - Colorado School of Mines Golden, USA

Session: Nitriding I Carburizing

Chairman: B. Edenhofer

9.30

Innovative nitrocarburizing treatments applied to PM steels

M. Rosso, G. Scavino, P. Jaquot - Politecnico di Torino, Italy

Gas-solid nitrocarburizing and oxidation of steel: kinetic modelling and industrial process engineering

J. Dulcv, L. Torchane, M. Gantois - Ecole des Mines Nancy, France

D. Zimmermann - Societe Solo de Porrentruy, Switzerland

Influence of pulse frequency on plasma nitrocarburizing compound layer structure

V. Leskovsek, M. Dobersek - Institute of Metals and Technology Ljubljana, Slovenia

Ionic nitrocarburizing of commercial sintered steels in the range from A1 to A3

Elio Gianotti, Ezio Gianotti - Ferioli & Gianotti Rivoli, Italy

10.50 coffee break

11.20

Microstructural evolution of the compound layer during nitriding and nitrocarburizing; the role of carbon

M.A.J. Somers - Technical University of Denmark, Lyngby

Carbon influence in the nitrocarburized layers

A. Bavaro - Laboratorio Prove Bavaro Caravaggio, Italy

G. Pizzi - Soliveri Caravaggio, Italy

A. Visconti - Vacuum Trezzano s/n, Italy

Carbon and nitrogen interaction relationship with residual stress distribution in plasma nitrided steels

M. A. Nosratinia - Esfarayen Steel Tehran, Iran

A concept for faster carburizing in continuous furnaces

T. Holm - AGA AB Lidingo, Sweden

L. Adrudsson - AGA GAS AB Sundbyberg, Sweden

T. Thors - Volvo Car Components Corp. Koping, Sweden

Session: Electron Beam and Induction Heat Treatment

Chairman: E. Stagno

9.30

Surface treatment by electron beam (State of the art)

R. Zenker - ETC Chemnitz, Germany

Selective treatment of complex part surface by multifrequency induction hardening to optimize material characteristics

B. Criqui, M. De Sousa Diaz - Renault, France

S. Plano, F. Gili - Centro Ricerche Fiat Orbassano, Italy

C. Pichard - Ascometal Amneville, France

G. Bonzano - Saet Leini, Italy

Effect of an electron beam treatment on metastable hard coatings

S. Friedrich, K. Wilsdorf, F1J. Spies - Freiberg

University of Mining and Technology, Germany Surface modification of high temperature alloys by high power electron beam

Yu.D. Yagodkin, K.V. Pastuhov - Moscow State Aviation Institute, Russia

S.A. Muboyadjyan - All-Russian Institute of Aviation Materials, Russia

10.50 coffee break

11.20

Induction technique for heat treatment in the third millennium

V.S. Nemkov Centre for Induction Techn. Auburn Hills, Usa

Process and product checks in the optimization of the induction heating treatments

G. Jukic - GKN CFI Campi Bisenzio, Italy G. Rubatto - Saet Leini, Italy

Magnetic field controllers for induction heat treatment

R.S. Ruffini, R.T. Ruffini - Fluxtrol Auburn Hills, Usa

Session: Innovation in Processes and Equipment

Chairman: W. Moerdijk

9.30

Surface heat treatment by using advanced grinding processes

E. Brinksmeier, T. Brockhoff - IWT Bremer, Germany

Heat treatments for the elimination of hydrogen embrittlement in AuCu/B4C electrodeposited composites: thermal analysis, fractography and mechanical characterization

B. Bozzini, P.L. Cavallotti, G. Giovannelli - Politecnico di Milano, Italy B. Brevaglieri, A.

Brotzu, M. Cecchini, S. Natali, G. Signorelli - Universita di Roma, Italy

Technological conditions of implementation on PAPVD methods into industry

J. Walkowicz, J. Smolik, K. Miernik, J. Bujak - Inst. for Terotechnology Radom, Poland

Microstructure of the surface layer produced in a 1%C, 1.5%Cr steel by hard machining

A. Barbacki, M. Kawalec - Poznan University of Technology, Poland

J.A. Kozubowski - Warsaw University of Technology, Poland

10.50 coffee break

11.20

Study of diffusion in thin colaminated ferritic stainless steel-aluminium

U. Bernabai, A. Brotzu, F. Felli - Universita La Sapienza Roma, Italy

CERAJET 4", new high-performance firing equipment for indirect natural-gas heating

A. de La Faire, S. Ressant - GDF Saint-Denis La Plaine, France

A. Lebris - Serthel Claye Souilly, France

Plenary Session

Chairman: L Montevecchi

Keynote speaker Material and heat treatment simulation tools for improved bearing performance

I. Slycke, M. Persson, Ch. Fajers - SKF Engineering & Research Centre Nieuwegein, The Netherlands

Session: Nitriding / Carburizing

Chairman: D. Couratin

14.45

Characterization and optimization of a carburizing treatment in gas phase: definition of a new process

J. Dulcy, Ph. Bilger, M. Gantois - Ecole des Mines Nancy, France D. Zimmermann - Societe Solo de Porrentruy, Switzerland

Plasma carburizing of Tungsten assisted by RF-induction heating

K. Nakata - Osaka University, Japan K. Kawamura - Chubu Electric Power Co. Nagoya, Japan T. Kitada - Nihon Denshi Kohgyo Co. Kanagawa, Japan

The carburizing of steel with Hydrocarbon gas in low relative pressures

F.M. Montevecchi, S. Villa - Bioteco Segrate, Italy

D. Valtolina - Sol Monza, Italy

Plasma carburizing of M50NiL and 5-6Cr alloyed tool steels

S. Fukumoto - Hitachi Metals Shimane, Japan N. Kanayama - Inst. of Industrial Science and Techn. Shimane, Japan

16.05 coffee break

16.35

Comparison of different plasma carburizing and gas carburizing process concerning process duration and dimensional alterations

B. Gondesén, F.T. Hoffmann, P. Mayr - Institut fib- Werkstofftechnik Bremen, Germany

Microstructural changes in case hardening steel due to rolling contact fatigue

N. Uchiyama, N. Kino, T. Matsumoto, K. Otani - Nissan Motor Ltd Yokosuka, Japan

Effect of deforming and heat treatment processes on grain size and fatigue strength in case-hardened components

St. Hock, J. Kieff, M. Schulz, A. Sollich, D. Wiedmann - ZF Friedrichshafen, Germany

Development of the duplex process of diffusion formation of carbide layers

M. Stupnisek, B. Matijevic - University of Zagreb, Croatia

The new controlled-atmosphere chamber furnaces (protective or carburizing atmosphere) that use different mixtures of water and polymers as an alternative quenchant to the mineral oils

M. Mangiavacca - Cofi Peschiera Borromeo, Italy

Session: Mechanical Properties and Engineering Applications

Chairman: R. Roberti

Mechanical properties of a centrifugally cast Al-A13Ti composite

A. Sato, S. Kumai, Y. Mishima - Tokyo Inst. of Technology Yokohama, Japan

Influence of pre-oxidation on the wear at high temperature of steels 28NCDV10/Z20C13

M. Labaiz - University of Annaba, Algeria I. Guillot, G. Beranger - University of Technology Compiègne, France

Three body wear tests to assess performance of implant materials

M.H. Staia, C. Enriquez, E.S. Puchi - Central University of Venezuela, Caracas

Influence of heat treatments on wear resistance of hot and cold working tool steels

M. Rosso, G. Scavino - Politecnico di Torino, Italy

16.05 coffee break

16.35

Tribological properties of nickel-aluminide coatings on steel substrate

F. Ashrafizadeh, M. Salehi, M. Shamanian - University of Technology Isfahan, Iran

Frictional behaviour and wear resistance of hard coatings dry sliding against a TiN coated tool steel

L. Ceschini, E. Lanzoni, G. Palombarini - University di Bologna, Italy

Improvement of tribological properties with DUPLEX treatments

Y. Corre, L. Poirier, J.P. Lebrun - NitruvidAigenteuil, France

Tribological behaviour of thermal spray coatings on steel

M.R. Baghbanan, F. Ashrafizadeh, M. Salehi - University of Technology Isfahan, Iran

Session: Non-Conventional Applications

Chairman: E. Gianotti

14.45

The structural, electrical and optical properties of zinc oxide thin films produced by direct and indirect methods of evaporation

H. Kashani - Tehran University, Iran

Corrosion resistant plastic mould steels. Possibilities and limits of different production routes in respect to special applications

G. Lichttenegger, G. Hochortler, J. Sammer - Baler Edelstahl Kapfenberg, Austria

Effect of process temperature in HVOF thermal spray coating of Al-SiC MMC

Y.M.A. Al-Abdeli, L. Looney, IvI.SJ. Hashmi - Dublin City University, Ireland

Washing before heat treatment

A. Bongioanni - ITS Mesero, Italy

16.05 coffee break

16.35

Expanding applications of Rf-GDOES for depth profile analysis

P. Chapon, T. Neils - jobin Yvon Emission Longjumeau, France

Chemical electroless deposited Ni-P layers on steels - characteristics and new perspectives of application

M. Tacikowski, K. Sikorski, P. Bielinski, T. Wierzchon - Warsaw University of Technology, Poland

Ecological machining without cutting fluids

P. Louda - Techn. University of Liberec, Czech Republic

The change of structure and properties of type 18-8 austenitic steel after big shear strains

G.G. Mukhin - Bauman Moscow State Techn. University, Russia

N.S. Starostinskava, L.G. Onuchin, A.V. Klimenko - GNPP Temp Moscow, Russia

Poster Session

Session: Nitriding I Carburizing

Plasma diffusion treatments of titanium alloys under glow discharge conditions

T. Wierzchon, A. Fleszar, E. Czarnowska - Warsaw Univ. Techn., Poland

PVD hard coatings on prenitrided low alloy steel

W. Liang, X.X. Lei - Dalian Maritime Univ., China

W. L. Shi - Chinese Academy of Sciences Shen Yaang, China

New properties of the gas nitriding in the anticorrosion treatment of steels

V.M. Zintchenko , V.Ya Svropjatov - Scientific and Research Institute for Automobile Production Technology, Russia

Environmental impacts of nitriding and nitrocarburizing

G. Horvath, J. Buchgeister - University of Bremen, Germany

Ionic nitriding of sintered high speed steels

A.V. Vinogradov, V.V. Gomov, G.G. Mukhin, M.S. Pavlov - Bauman Moscow State Techn. University, Russia

On the structure of nitrided steels

S.A. Gerasimov, V.I. Kutcheryavyi, S.D. Karpoukhin, E.A. Eliseev - Bauman Moscow State Techn. University, Russia

New abilities of the gas nitriding, as the anticorrosion treatment for mishin parts

V. Zintchenko, V. Syropiatov - NIITartoprom Moscow, Russia

The role of glow discharge in nitriding of Armco iron

J. Micharski - Inst. of Precision Mechanics Warsaw, Poland

Computer simulation for plasma carburizing and nitrocarburizing of alloyed steels

N.M. Ryzhov, M.J. Semenov - Bauman Moscow State Technical University, Russia

Phase constitution calculation in nitrocarbonized surface layers for contact durability prediction of Cr-Mo-W-V steels

L.V. Tarasenko, A.N. Outkina, V.I. Titov - All-Russian Institute of Aviation Materials, Russia

Automated monitoring and control system for plasma heat treatment technologies

A.E. Smirnov, D.N. Ryzhov - Bauman Moscow State Technical University, Russia

Some aspects of phase constitution of diffusion layers obtained by austenitic nitrocarburizing and quenching from eutectoid transformation temperature

D. Nica, V. Iancau, G. Vermesan, G. Negrea - Technical University of Cluj-Napoca, Romania

Oxidation mechanisms of nitride and carbonitride layers: nature and morphology of Fe₃₀₄/E layers

L. Torchane, Ph. Bilger, H. Michel, J. Dulcy, M. Gantois - Ecole des Mines Nancy, France

Plasma carburizing of tool steels

R.S. Fahurtdinov - Bauman Moscow State Technical University, Russia

The influence of technological heredity, created by thermochemical treatment, on the plastic deformation hardening

S.A. Pahomova - Bauman Moscow State Technical University, Russia

Study on cooling cathode arc plasma carbonizing and mechanism

C.M. Li, J.D. Pan, B.H. Fan, Z. Xu - Taiyuan Univer. of Technology, China

Duplex treatment: applications of tribological coatings combined to plasma carburized layers

B. Stauder, G. Prunel - Thermi-Lyon Group, France J. Rechberger - Vilab Berne, Switzerland

The evolution of low pressure carburizing and plasma carburizing in today's heat treatment industry

W. Grafen - IPSEN International Kleve, Germany

Heat treatment and surface carburizing of sheet steel performed in a new annealing simulator at IEHK-RWTH Aachen

W. Bleck, M. Ahrens - Inst. of Ferrous Metallurgy Aachen, Germany

Nitriding pretreatment on DLC coated tool steels

G. De Ponti, L. Nobili, P.L. Cavallotti - Politecnico di Milano, Italy

A. Mancuso - Colmegna Siziano, Italy

Reducing deep nitriding time through the use of an optimized nitriding steel

P. Dubois - Aubert et Duval Gennevilliers, France

High efficiency carburizing atmospheres

L. Druga, E. Ghelec - INTEC Bucarest, Romania

Session: Modelling

Surface hardening of quenched and tempered rolling mill rolls

S. Pawlak, B. Hoderny - Institute of Ferrous Metallurgy Gliwice, Poland

A structural - kinetics model for vacuum coatings

R.I. Shishkov - University of Rousse, Bulgaria

Simulation of steel quenching

B.Smoljan - University of Rijeka, Croatia

The modelling of residual stresses after direct hardening of carburized and carbonitrided low and highcarbon steels

M. Przylecka, W.Gestwa - Poznan University of Technology, Poland

Generalization of the avrami model for the description of anisothermal multiphase transformations

T. Reti, L. Horvath - Banki Donat Polytechnic Budapest, Hungary

A study on the optimized microstructure with excellent mechanical properties and the relevant heat treatment in ductile cast iron

Z.R. He, S. Ji - Fuzhou University PR., China

Numerical simulations for optimization of the process of heating for massif pieces liable to heat treatment

V. Soporan - University of Cluj-Napoca, Romania

Modelling and measurement of residual stresses in situ during plasma nitriding

G. Vermesan - Techn. Univ. of Cluj-Napoca, Romania

N. Amariei, D. Leon, C. Comandar - Techn. University of Iasi, Romania

H.P. Lieurade, D. Duchateau, D. Ghiglione - Cetim Senlis, France

Identification of material parameters based on fuzzy inference and its application to simulation of quenching process

D.Y. Ju - Saitama Institute of Technology, Japan Monte Carlo simulations in carbon-based film growth modelling G. Maizza, B. DeBenedetti -Po/itecnico di Torino, Italy

J.F. Amstalden, R.G. Santos - Universidade Estadual de Campinas

Session: CVD/PVD

The possibilities of creation of (TiAl)N coatings on high-speed steel by using the arc method

M. Dabrowski, A. Rutkowska - Cracow University of Technology, Poland

The structure and tribological behavior of multilayer TiC-DLC on bearing steel by plasma-based complex treating

X. Wang, S. Minren, S. Yue, M. Xinxin - Harbin Inst. of Technology, China
Z. Zhenxin, L. Guang - Harbin University of Science and Techn., China

ACD-Ni/PVD-Nitride duplex coatings to enhance corrosion and wear resistance

C. Fazio - Enea Camugnano, Italy
E. Lanzoni, C. Martini - University di Bologna, Italy
D. Romagnoli - Samputensili Zola Predosa, Italy

PVD hard coating applications update

D.T. Quinto - Balzers Ltd. Balzers, Liechtenstein

DLC coatings with transferred plasma on tool steels and Tungsten carbides

L. Nobili, G. De Ponti, P.L. Cavallotti - Politecnico di Milano, Italy

Heat treatment of ACD Ni-P coatings

B. Bozzini, L. Nobili, P.L. Cavallotti - Politecnico di Milano, Italy

Session: Laser Treatment

The analysis and generalization of the steels microstructure and microhardness data after laser quenching

A.N. Safonov, S.L. Eritsian - Bauman Moscow State Technical University, Russia

Laser alloying of the corrosion resistant chromium steels

T.V. Tarasova - Bauman Moscow State Technical University, Russia

Laser surface treatment of the electroless Ni-P alloy plating on steel

M.Hino, N. Nishida, M.Hiramatsu - Industrial Techn. Research of Okayama Prefecture Governm., Japan
M. Tsujikawa, M. Kawamoto - University of Osaka Prefecture, Japan

Rare earth La2O3 modification of laser clad coatings

Z. Yunming - University of Macau, Macau
E. Kunlin, Z. Qingbo, W. Xingguo - Tsinghua University Beijing, China

Laser hardening. Practical experiences and examples

A.S. Bransden - Bodycote Lasertechnik Nurnberg, Germany

Research in the microstructure of the light band in the fusing region of laser cladding

X. Chun - Shangai College of Metallurgy, China

Thermal surface hardening of titanium alloys using concentrated energy flows

Gordienko, V.V. Ivashko - National Academy of Sciences Minsk, Belarus

Session: Innovation in Processes and Equipment

Design and research development of WZH60 model vacuum tempering furnace with convection capacity

Y. Cheng Pei - Ministry of Machinery Ind. Beijing, China

Ultra-high Vacuum furnace for the niobium cavities purification process

P. Favaron, V. Palmieri -I.N.F.N. Legnaro, Italy

G. Tonini, G. Cioni - T.A.V. Caravaggio, Italy

Study of the industrial applications of a new direct injection system for the generation of protective atmospheres

M. Rosso - Politecnico di Torino, Italy

R. De Wilde - Praocair, Belgium

G. Porto - Rivoira, Italy

Dry pumping for the metallurgical industry

W. Westlake et al. - Edwards High Vacuum Crawley, United Kingdom

New technique of composite metal wetting built-up welding

B. Ju, B. Shuhui, L. Wenbin -North China Electric Power Univ. Beijing, China

Session: Bulk Heat Treatment

A scanning electron microscopy study of austempered spheroidal graphite aluminium cast irons

S.M.A. Boutorabi - Iran University of Science and Techn., Tehran

Influence of ageing on structure and fracture mechanism of austenitic Fe-Ni-Ti and Fe-Cr-Mn steels

N.A. Klevtsova, G.V. Klevtsov - Orenburg Univer. Orsk, Russia

Investigation of dynamic recrystallization of low carbon micro alloyed plate

X. Ma, L. Xu, G. Shao, Y. Min, J. Chen - Shanghai University, China

Effect of heat treatment in the austenitic range and hot forging on the ductility and toughness of the maraging steel

S. Pawlak - Institute of Ferrous Metal. Gliwice, Poland

The research of the heat treatment processes on the transmission shaft

H. Genliang, S. Honghong - Jiangsu University of Science & Tech., China

Application of factors controlling method in new developed heat treatment processes

O. Irretier - Nabertherm Bremen, Germany

Microstructure control of martensitic phase in advanced ferritic steels for USC boilers to achieve long term stability at high temperature

S. Muneki, M. Igarashi, F. Abe - National Research Inst. for Metals Ibaraki, Japan

High vacuum conditioning

M. Gabriel, C. Leroux, C. Tournier - Vide et Traitements Service Gennevilliers, France

Effect of age hardening heat treatment on strengthening ratio of particulate metal matrix composites

M. J. Hadianfard - Shiraz University, Iran

Thermals stress analysis in heat treatment by finite element method

K. Janghorban, R. Eqra - Shiraz University, Iran

Modified austempering heat treatment of an alloyed ductile iron

A. Nazarboland - Shiraz University, Iran

R. Elliott - University of Manchester, United Kingdom

The cooling characteristics of the three-phase fluidised bed

G. Huang -Jiangsu University of Science & Techn., China

Time-temperature-transformation diagrams of some alloy materials

G.D. Pigrova - Central Boiler and Turbine Inst. St. Petersburg, Russia

Equivalency of low temperature brittleness and embrittlement due to age hardening in duplex stainless steels

I. Dlouhy - ASCR Brno, Czech Republic

J. Pechmanova - Ecosond Prague, Czech Republic

Investigation of quench behaviour of eccentrically drilled steel cylinders

C.H. Gur, W. Schuler, A.E. Tekkaya -Middle East Techn. Univer. Ankara, Turkey

Heat treatment and performances of innovative hot working tool steel

M. Rosso -Politecnico di Torino, Italy A. Bennani,
A. Vuillermin, U. Regina - Cogne Acciai Speciali Aosta, Italy

A study on microstructural evolution of super duplex stainless steels (SAF 2507) induced by isothermal heat treatment

F. Bonollo, A. Gregori, A. Tiziani - University di Padova, Italy J.O. Nilsson - AB Sandvik Steel Sandviken, Sweden

Phase diagrams and heat treatments

S. Aissa - US.TO Oran, Algeria

Heating time of 30Mn2 steel in quench process

W. Kang- Mian - Lian-Yuan Iron and Steel Group Ltd. Company Hunan Province, China

Session: Mechanical Properties and Engineering Applications

The advancement of the destruction processes in heat treated steel under static tension and compression

B.A. Prusakov - Bauman Moscow State Techn. University, Russia

Formation of structure and properties of VT23 weldings due to high-frequency current treatment

S.I. Kniazeva, V.S. Liasotskaia - Moscow Aviation Techn. v., Russia

Observance of the principle of structural and dimensional conformity when applying the protective coatings

B.N. Arzamasov, L.G. Kirichenko, T.V. Solovjeva -Bauman Moscow State Technical University Russia

Effects of Nb-addition and tempering of strength and toughness of low carbon steels with coarse upper bainite

Y. Ruicheng - Gansu University of Techn. Lanzhou, China

Spring steel particularly elastic and ductile condition

A. Rakhstadt, I.G. Vorobyeva - Bauman Moscow State Team, Univ., Russia
V.M. C hertov - Donetsk Eng. Physical Centre Moscow, Russia

Nondestructive indentation testing control of mechanical characteristics of non-homogeneous with depth materials

S.M. Aizikovich, I.L. Krenev, A.N. Serova - Rostov State I rriiversity. Russia

Prediction the jominy curves by means of neural networks

T. Filetin, J. Galinec - University of Zagreb, Croatia

The influence of ageing treatment on the tensile and notched tensile properties of the advanced spray casting aluminium alloys of 7300 series

S.A. Jenabali Jahromi - Shiraz University, Iran

R.F. Chocrane - Leeds University, United Kingdom

Fatigue strenght of (Fe,M.)-C-N alloys after precipitational hardening

A. Nakonieczny, J. Tacikowski, J. Michalski - Institute of Precision Mechanics Warszawa, Poland

Fractography of carburized and carbonitrided steels subjected to single and repeated fractures (review)

I. Ivanov - Technical University Varna, Bulgaria

New advanced technology of special antifriction mechanical treatment for railway wheels surface protection

V. Balabanov, S.Manykin - Splay Company Moscow, Russia

V.Vologdin -Freal Company St.Petersburg, Russia

Hydrogen's interaction with hardened surface layers in dry and lubricated frictional couples

P. Kula, R. Pietrasik - Technical University of Lodz, Poland

Increase of wear resistance of cast iron break shoes due to heat treatment

V.L. Naydek, I.G. Neizhko, V.P. Gavrilyuk, V.G. Tchervi - National Academy of Sciences Kiev, Ukraine

Increasing of wear-resistance of cutting and abrasive tools by plasma treatment in Vacuum

A.A. Kaidalov - Incors Kiev, Ukraine

Tribological properties of borosiliconized carbon steels

S.R. Bakhshi - Isfahan Univ., Iran

F. Ashrafzadeh, M. Salehi - University of Technology Isfahan, Iran

Comparison between tribological behavior of Fe-Al and Fe-Al-Ti intermetallic coated carbon tool steel

A. Tahvilian, F. Karimzadeh, M. Salehi - Isfahan University of Technology, Iran

Tribological behaviour of Ti-Ni intermetallic coated carbon tool steel

F. Karimzadeh, A. Tahvilian, M. Salehi - Isfahan University of Technology, Iran

Wear and mechanical properties of graphite bronze P/M parts

M.M. Moshksar, A. Dehghan, M.M. Enayati - Shiraz Univ., Iran

Wear study of plough tools

K. Janghorban, H. Eskandari - Shiraz University, Iran

Mechanical surface modification of metal materials in surface-active lubricating media

L.M. Rybakova, L.J. Kuksenova - Moscow, Russia

Soldering of ultra-high strength tools steels

A. Schulz-Becuken - Soest, Germany

Continuous material hardness measuring process

E. Trottet - Echaudens, Switzerland

Correlations between the surface heat treatment, the stress distribution and the maximum durability, in the roofing-line contact case

A. Munteanu, D. Munteanu - University of Brasov, Romania

Influence of surface microcracks on wear resistance austempered grey iron cylinders

O. Eparkhin, N. Vershinina, I. Lavrenov - Yaroslavl State Techn. University Russia

The heat treatments, microstructures and properties of ultra-low carbon high strength bainitic steel for low temperature severe applications

A.K. Lis, J. Lis, L. Jeziorski - University of Czestochowa, Poland

Thermal fatigue behaviour and fracture toughness of a Vacuum treated H11 steel

M. Faccoli, G.M. La Vecchia, R. Roberti - Universita di Brescia, Italy

G. Straffelini - Universita di Trento, Italy

Session: Electron Beam and Induction Heat Treatment

Advanced method of induction hard-facing of steel parts surface

V.V. Vologdin - Freal St. Petersburg, Russia

V.M. Ganjuchenco - Electrotechnical University St. Petersburg, Russia

Y.A. Zaichenko - Eng. Centre Splay, Russia

V.S. Nemkow - Centre for Induc. Techn., USA

Systems of transformation of scientific research results into technological solutions

A. Mazurkiewicz - Inst. for Terotechnology Radom, Poland

Relations between directions of research work in surface engineering and industrial practice

T. Burakowski - Inst. of Precision Mechanics Warsaw, Poland

A. Mazurkiewicz, K. Miernik, J. Walkowicz - Inst. Terotechnology Radom, Poland

New progress of air-cooled bainitic steels. New material in the 21st century

H.S. Fang, Z.G. Yang, Y.K. Zheng - Tsinghua University Beijing, China W.G. Huang - Chongqing University, China

Application of Raman microscopy to optimization of the technology production and heat treatment of polycrystalline silicone

I.M. Abdulhanov, B.A. Prusakov - Bauman Moscow State, Russia
V.S. Gorelik - Lebedev Physical Inst. Moscow, Russia
V.G. Plotnichenko - Common Physics Inst. Moscow, Russia

Hardening of thin Fe-Mn films by ion-beams

G. Principi, C. Tosello - Universita di Padova, Italy

Electron beam surface hardening - calculation and experimental investigations

I.L. Pobol, A.A. Shipko - National Academy of Sciences Minsk, Belarus

Session: Non-Conventional Applications

Densification of metals by used HIP

O.V. Nechaeva - Moscow Aviation Technology University, Russia

Alloys and coatings corrosion monitoring system

I.A. Poutchkov, T.N. Krouglova, O.N. Ukolova - Bauman .Moscow State technical University, Russia

Preliminary study on plasma diagnostics of double-glow discharge plasma surface alloying

Z. Xu, C.M. Li - Taiyuan University of Techn., China

The effect of heat treatment on the structure and hardness of nickel-chromium alloys electrodeposited from a citrate bath

M.E. Bahrololom, A. Hoveiclaei - Shiraz University, Iran

Effect of plasma distribution on double-glow surface alloying

C.M. Li, Z. Xu - Tatman University, of Technology. China
X.S. Xie - Beijing I. University of Science and Techn. China

Diffusion saturation of non-alloyed electrical steels

A.A. Ziabrev - Bauman Moscow State Technical University, Russia

Plasma vacuum diffusive titanizing of steels

R. Shishkov, G. Iorclanova - University of Rousse, Bulgaria

Plasma vacuum diffusive chromizing in the reaction scheme

R. Shishkov., M. Conova - University of Rousse. Bulgaria

The investigation of deformed and heat treated 7049 Al alloys

H. Unai - Sahara University Adapazari, Turkey

Kolsterizing: surface hardening of austenitic stainless steel

P. Gumpel, R.H. Van der Jagt - Apeldoorn. The Netherlands

Effect of charge treating time on the energy consumption in heat treatment processes of machine elements

T. Burakowski, F. Wojtkun - Radom Univ. of Techn, Warsaw. Poland

J. Kahata - Warsaw I University of Technology, Poland

Mechanical integrity of the oxide scale on alloy 603 GT at 1100° C

F. Hekelmann, V. Guttmann -JRC Petten, The Netherlands

A. von Reitz - Energieonderzoekcentrum Nederland Petten

U. Brill - Krupp VDM Werdohl, Germany