



27TH IFHTSE CONGRESS & EUROPEAN CONFERENCE ON HEAT TREATMENT 2022

September 5-8, 2022

Wyndham Grand Salzburg Conference Center
Salzburg - Austria



Table of contents

| | |
|--|----|
| Tuesday 06 September 2022 | 2 |
| ROOM 1 SALZBURG | 2 |
| ROOM 2 WOLFGANGSEE | 4 |
| ROOM 3 ATTERSEE | 5 |
| Social programme..... | 3 |
| Wednesday 07 September 2022 | 6 |
| ROOM 1 SALZBURG | 6 |
| ROOM 2 WOLFGANGSEE | 8 |
| ROOM 3 ATTERSEE | 10 |
| Poster session, Network evening..... | 12 |
| Thursday 08 September 2022 | 13 |
| ROOM 1 SALZBURG | 13 |
| ROOM 2 WOLFGANGSEE | 14 |
| ROOM 3 ATTERSEE | 15 |

Tuesday 06 September 2022

Opening (09:30-09:50)

Awards (Fellowship, Honorary President, Medal) (09:50-10:20)

KEYNOTE: Dr. Stefan HOCK „50 years of IFHTSE – Paths from the past to the present and beyond“ (10:20-10:50)

10:20 [113] 50 years of IFHTSE – Paths from the past to the present and beyond

HOCK, Stefan

KEYNOTE: Prof. John G. SPEER (IFHTSE Medal) “Recent developments and perspectives of heat treatment in steel processing” (10:50-11:20)

10:50 [111] Recent Developments and Perspectives of Heat Treatment in Steel Processing

SPEER, John (Colorado School of Mines)

Lunch (11:20-12:50)

KEYNOTE: Prof. Massimo PELLIZZARI „The importance of Heat Treatment in Additive Manufacturing of tool steels and Ti alloys“ (12:50-13:20)

12:50 [114] The importance of Heat Treatment in Additive Manufacturing of tool steels and Ti alloys

PELLIZZARI, Massimo (University of Trento)

HEAT TREATMENT: Heat Treatment and Surface Engineering in Additive Manufacturing (13:20- 15:00)

Heat Treatment and Surface Engineering in Additive Manufacturing

Session chair: PELLIZZARI, Massimo (University of Trento)

13:20 [18] Vacuum heat treatment of Ti6Al4V alloy produced via SLM additive manufacturing

VALSECCHI, Giorgio

13:45 [61] Recent advances in heat treatment and surface engineering within metal additive manufacturing

CHRISTIANSEN, Thomas (Technical University of Denmark)

14:10 [28] Simultaneous aging and surface treatment of 3D printed maraging steel

FELDE, Imre (Óbuda University)

14:35 [29] Influence of the total thermal cycle during wire-based cladding by means of electron beam and subsequent boriding on the microstructure and properties of the Inconel 718 layer

BUCHWALDER, Anja (TU Bergakademie)

Coffee Break (15:00-15:20)

**HEAT TREATMENT: Heat Treatment of Non-ferrous
Alloys & Advanced Surface Engineering (15:20-16:35)**

Heat Treatment and Surface Engineering in Additive Manufacturing

Session chair: KLÖSCH Gerald

15:20 [46] The effects of heat treatments on the mechanical properties of secondary aluminium alloys

ÖZAYDIN, Onur (Cevher Jant Sanayii A.S.)

15:45 [50] Analysis of the stress-relief heat treatment of aluminium alloy wheels

ÖZAYDIN, Onur (Cevher Jant Sanayii A.S.)

16:10 [84] Modification of boride layers on alloy steel by impulse electron beam

MISHIGORZHIYN, Und-rakh (Institute of Physical Materials Science)

Sightseeing Walking Tour from Wyndham Grand Salzburg Conference Center to the Residence Salzburg **(17:00-18:30)**

Residence Salzburg-CONCERT **(18:30-19:30)**

Conference Dinner-Restaurant „Stiegl-Keller“ Salzburg **(19:30-22:00)**

Tuesday 06 September 2022

SURFACE ENGINEERING: Surface Hardening, Carburizing, Carbonitriding (13:20-15:00)

Surface Hardening, Carburizing, Carbonitriding

Session chair: OKUMIYA, Masahiro (Toyota Technological Institute)

13:20 [6] Determination of machining parameters for a specific adjustment of the residual stress profile by induction hardening

FRERICHS, Friedhelm (Leibniz-IWT)

13:45 [27] Carbon penetration behavior of Cr-Mo steel specimen in carburizing above eutectic temperature

YAMAMOTO, Ryosuke (Kansai University)

14:10 [40] Martensitic Induction hardening of nitrided layers

HOJA, Stefanie (Leibniz-Institut für Werkstofforientierte Technologien)

14:35 [68] Impact of process parameters during multi-step carbo-austempering on the hardness and microstructure morphology

FECHTE-HEINEN, Rainer (Leibniz-Institut für Werkstofforientierte Technologien)

Coffee Break (15:00-15:20)

SURFACE ENGINEERING: Surface Hardening, Carburizing, Carbonitriding (15:20-17:00)

Surface Hardening, Carburizing, Carbonitriding

Session chair: FECHTE-HEINEN, Rainer (Leibniz-Institut für Werkstofforientierte Technologien - IWT)

[86] Contact fatigue in carbonitrided steels and the influence of retained austenite

STÅLNACKE, Emil (Swerim AB)

[1] Carbo-nitriding of CVT pushbelt components for further optimization of wear and fatigue properties

PENNINGS, Bert (Bosch Transmission Technology B.V.)

[71] Influence of nitrogen enrichment on microstructure and mechanical properties of a carbonitrided low steel alloy

MARÉCHAL, David (IRT M2P)

[72] Influence of shot peening on carbonitrided low alloy steel

MARÉCHAL, David (IRT M2P)

Tuesday 06 September 2022

STEEL: Continuous Heat Treatment Processes for Steels (13:20-15:00)

Continuous Heat Treatment Processes for Steels

Session chair: SPEER John G.

13:20 [64] Continuous Annealing Digital Twin Implementation and Calibration

EISL, Roland (ENRAG GmbH)
SEEMANN, Peter (EBNER Industrieofenbau GmbH)

13:45 [23] Influence of the quenching and partitioning heat treatment process on the hydrogen embrittlement resistivity of 20MnSi steel

ELASYED, Hamdi (TU Graz)

14:10 [69] Replacement of Si by Al in Q&P-steels and its effect on the tempering behavior of martensite

WALLNER, Matthias (Univ. of Appl. Sciences Upper Austria)

Coffee Break (15:00-15:20)

STEEL: Heat Treatment of Steels(15:20-16:10)

Continuous Heat Treatment Processes for Steels

Session chair: SEEMANN, Peter (EBNER Industrieofenbau GmbH)

15:20 [2] The hydrochloric acid corrosion susceptibility of steel rebars exposed to heat treatments

PAGLIA, Christian (SUPSI, Institute of materials and constructions)

15:45 [67] Energy efficient manufacturing chain for advanced bainitic steels based on thermo-mechanical processing

DE CASTRO, Pedro José (Leibniz-Institut für Werkstofforientierte Technologien)

Wednesday 07 September 2022

KEYNOTE: Dr. Tirumalai S. SUDARSHAN „The Kaleidoscope of Surface Engineering” (08:30-09:00)

8:30 [112] The Kaleidoscope of Surface Engineering

SUDARSHAN, Tirumalai S
(Materials Modification Inc
(MMI))

HEAT TREATMENT: Modelling and Simulation (09:00-10:40)

Heat Treatment and Surface Engineering in Additive Manufacturing

Session chair: FELDE, Imre (Óbuda University)

9:00 [4] Visualization of vapor film collapse mode during unsteady boiling on oil quenching by using cellular automaton simulation

SUGIMOTO, Tsuyoshi (National
Institute of Technology, Asahikawa
College)

9:25 [15] Combined CFD and heat treatment simulation of high-pressure gas quenching process.

HEINZ, Paul (Schaeffler) **JUCKE-**
LANDT, Kay (Schaeffler)

9:50 [35] Applying the ANSYS GEKO Turbulence Model to Simulate Jet Impingement Cooling in Continuous Heat Treatment Lines

MENZLER, Jan Erik
(RWTH Aachen University)

10:15 [55] Experimental and numerical investigation of heterogenous gas quenching for determining optimal heat treatment parameters

NARAYAN, Nithin Mohan (Leibniz
Institute for Materials Engineering)

Coffee Break (10:40-11:10)

HEAT TREATMENT: Modelling and Simulation (11:10-12:25)

Heat Treatment and Surface Engineering in Additive Manufacturing

Session chair: LÜBBEN Thomas

11:10 [106] Analysis of shots flight inside and outside of peening nozzle

SAEKI, Yusuke (Toyota
Technological Institute)

11:35 [37] Simulated Strains-Based Approach for Explaining Distortion and Residual Stress in Quenched Steel Cylinder

ARIMOTO, Kyoza
(Arimotech Ltd.)

12:00 [30] Application of New Artificial Neural Network model to predict Heat Transfer Coefficients during Quenching

FELDE, Imre (Obuda
University)

Wednesday 07 September 2022

Lunch (12:50-14:20)

HEAT TREATMENT: Energy and Environmental Aspects (14:20-15:35)

Heat Treatment and Surface Engineering in Additive Manufacturing

Session chair: WALDENMAIER Thomas

14:20 [5] Discussion on energy saving and emission reduction technology of heat treatment equipment

BUCHNER, Klaus
(Aichelin Holding GmbH)

14:45 [94] CO₂-Reduction by enhanced energy efficiency in LPC-heat treating plants

KAHLE, Ben (ALD Vacuum Technologies GmbH)

15:10 [25] CO₂-neutral process heating for carburizing furnaces – Ecological analysis and first experimental results

SANKOWSKI, Lukas
(RWTH Aachen University)

Coffee Break (15:35-16:05)

HEAT TREATMENT: Energy and Environmental Aspects (16:05-17:20)

Heat Treatment and Surface Engineering in Additive Manufacturing

Session chair: VANDEWIELE Bernard

16:05 [17] Carburizing atmospheres in heat-treatment furnaces - Contribution of industrial gases for reducing the carbon footprint

LEHMKUHL, Georg
(Air Liquide Deutschland GmbH)

16:30 [103] Decarbonization plan for conventional heat-treatment facilities : CO₂ contributors assessment, neutrality targets, levers and actions plan

WOIMBEE, Valerie
(Faurecia Forvia)

16:55 [53] Climate change and loss of biodiversity raise new provocations on the materials science and surface engineering

KOLOZSVARY, Zoltan
(Sapientia University, Tg.Mures)

IFHTSE - Vision 2040 (17:20-18:00)

-Conveners: Somers, Marcel (Technical University of Denmark)

Wednesday 07 September 2022

SURFACE ENGINEERING: Nitriding and Nitrocarburizing (09:00-10:15)

Surface Hardening, Carburizing, Carbonitriding

Session chair: JURČI, Peter (Slovak University of Technology)

09:00 [43] Impact of deep cryogenic treatment on nitridability and properties of nitrided hot work tool steel

PODGORNIK, Bojan
(Institute of Metals and Technology)

09:25 [87] Improving the properties of K490MC tool steel after hardening accompanied with deep cryogenic treatment and plasma nitriding

LANDEK, Darko (University of Zagreb)

09:50 [21] Effects of Chromium and Nickel Screens on Plasma Nitriding with Screen

NISHIMOTO, Akio
(Kansai University)

Coffee Break (10:40-11:10)

SURFACE ENGINEERING: Nitriding and Nitrocarburizing (11:10-12:50)

Surface Hardening, Carburizing, Carbonitriding

Session chair: JACQUOT Patrick

11:10 [74] High temperature solution nitriding and heat treatment of martensitic stainless steels for bearing applications

VILLA, Matteo (Technical University of Denmark)

11:35 [85] Solution nitriding of a Fe-0.13%C-1.2%Ni-13%Cr grade steel: a theoretical and experimental study

SKIBA, Olivier (IRT-M2P)

12:00 [45] Nitriding on as quenched steel 33CrMoV12-9

JÉGOU, Sébastien
(Arts et Métiers)

12:25 [8] Salt Bath Nitrocarburizing: Technology ready for future including environmental challenges

HERRMANN, Luc

Wednesday 07 September 2022

Lunch (12:50-14:20)

**SURFACE ENGINEERING: Advanced Surface Engineering
and Coating (14:20-15:35)**

Surface Hardening, Carburizing, Carbonitriding

Session chair: SCHNEIDER, Reinhold (Univ. of Appl.
Sciences Upper Austria)

14:20 [62] Advances in thermochemical surface engineering and heat treatment of titanium and titanium alloys

CHRISTIANSEN, Thomas
(Technical University of
Denmark)

14:45 [91] PACVD- and nitriding processes as surface treatments to enhance corrosion- and wear resistance of piston rods for the hydraulic industry

DIPOLT, Christian (RÜBIG
GmbH & Co KG)

15:10 [99] Surface nitriding of aluminum using barrel and its applications

OKUMIYA, Masahiro
(Toyota Technological
Institute)

Coffee Break (15:35-16:05)

Wednesday 07 September 2022

STEEL: Heat Treatment of Powder Metallurgical and Tool steels (09:00-09:50)

Continuous Heat Treatment Processes for Steels

Session chair: DANNINGER, Herbert (TU Wien)

09:00 [108] Insufficient heat treatment and retained austenite in tool steels and high-speed steels

LEITNER, Harald
(voestalpine Böhler Edelstahl GmbH & CoKG)

09:25 [3] Hardenability of PM steel alloyed using tailored Master Alloys

GEROLDINGER, Stefan (TU Wien)

Coffee Break (10:40-11:10)

STEEL: Heat Treatment of Stainless Steels (11:10-12:50)

Continuous Heat Treatment Processes for Steels

Session chair: LEITNER Harald

11:10 [10] Corrosion resistance of cryogenically treated tool steels.

JURIČ, Peter (Slovak University of Technology)

11:35 [54] Investigations on the effect of cooling rate on quenching & partitioning (Q&P) in martensitic stainless steels

KRESSER, Simona
(University of Applied Sciences Upper Austria)

12:00 [32] Fine grained high-interstitial stainless TRIP steel; processing and properties

SOMERS, Marcel A.J.
(Technical University of Denmark)

12:25 [75] Austenite aging of 17-4 PH martensitic stainless steel: phenomena, effects and implications

VILLA, Matteo (Technical University of Denmark)

Wednesday 07 September 2022

Lunch (12:50-14:20)

HEAT TREATMENT: Quenching Technology (14:20-15:35)

Heat Treatment and Surface Engineering in Additive Manufacturing

Session chair: PODGORNIK, Bojan (Institute of Metals and Technology)

14:20 [47] Design of a Quench Ring for Proper Quenching of Small Cylinders – Initial Investigation

LASNE, Patrice
(Transvalor S.A)

14:45 [48] Design of a Quench Ring for Proper Quenching of Small Cylinders –Modified Design

MACKENZIE, Donald
(Quaker Houghton Inc.)

15:10 [82] Control of quench severity by applying an electric potential during heat treatment of aluminium alloys

KRUG, Peter (Cologne University of Applied Sciences)

Coffee Break (15:35-16:05)

**HEAT TREATMENT: Quenching Technology
(16:05-17:20)**

Heat Treatment and Surface Engineering in Additive Manufacturing

Session chair: KUNTZMANN Bernard

16:05 [73] Development of an individually adjustable nozzle cooling system for optimization of the strip flatness for ultra-thin precision strips: state of the art and evaluation of the solution approaches

RADEMACHER, Nico
(RWTH Aachen University)

16:30 [42] Investigation methods for the determination of flow topography on horizontal surfaces in spray nozzle fields

HOE, Jan (RWTH Aachen University)

16:55 [51] Design of cooling sections for heat treatment based on laboratory measurements of heat transfer coefficient

KOTRBACEK, Petr (Brno University of Technology)

Wednesday 07 September 2022

POSTER (18:00-20:15)

- [12] Plasma nitriding properties of sintered body formed using CoCrFeNiMn high-entropy alloy powder by varying ball-milling duration
PENG, Jiaxin (Kansai University)
- [16] Gas-Cyclic Nitriding of Corrosion Resistant Steels
PETROVA, Larisa (MADI University)
- [22] Effect of the Amount of Zr Addition on Microstructure and Mechanical Properties of CoCrFeNi High-Entropy Alloys Prepared by Mechanical Alloying and Spark Plasma Sintering
FAN, Zixiang (Kansai University)
- [34] Influence of carbon contamination on the gas discharge composition in an active screen nitrocarburizing reactor
PIPA, Andrei (Leibniz Institute for Plasma Science and Technology)
- [52] Solution treatment duration influence on microstructural and mechanical properties of a cold-rolled Ti-Nb-Zr-Ta-Sn-Fe alloy
COJOCARU, Vasile Danut (University POLITEHNICA of Bucharest)
- [77] Study of the influence of heat treatment on the metallurgical characteristics of the IN625 alloy
PIZETTA ZORDAO, Luis Henrique (Politecnico di Milano)
- [88] Increasing the wear resistance of high-alloy tool steels for cold work with multilayer coatings TiN/TiCN and TiN/Ti-B-N applied by the PACVD process
LANDEK, Darko (University of Zagreb)
- [93] Abnormal plate type iron-carbonitrides development during salt bath nitrocarburizing of Fe-4wt.%V alloy
KASHYAP, Anupama (IIT Roorkee)
- [95] Cyclic application of ultrasonic shot peening and low-temperature liquid nitriding on 316 stainless steel
NEDURI, Jagadeesh (Indian Institute of Technology, Roorkee, India)
- [107] Salt Bath Quenching after Nitriding in AISI H13 Tool
CAMPOS FRANCESCHINI CANALE, Lauralice (EESC-USP)
- [110] Prospects for the use of additive manufacturing technology for manufacturing metal matrix composite materials
ABLEYEVA, Riana
- [116] Non-destructive determination of the hardness penetration depth by laser-ultrasound
SCHERLEITNER, Edgar (Research Center for Non Destructive Testing GmbH)

Networking-Evening: Network-Evening (18:00-20:15)

Thursday 08 September 2022

KEYNOTE: Prof. Jianfeng GU “Numerical Simulation of Heat Treatment and its Engineering Application” (08:30-09:00)

08:30 [115] Numerical Simulation of Heat Treatment and its Engineering Application

JIANFENG, Gu (Shanghai Jiao Tong University)

HEAT TREATMENT: Sören SEGERBERG memorial Symposium (09:00-10:40)

Heat Treatment and Surface Engineering in Additive Manufacturing

Session chair: TROELL Eva

09:00 [79] Quenching for the future -In memoriam of Sören Segerberg

TROELL, Eva (Unit manager)

09:25 [31] Born of SmartQuench - In Memoriam of Dr. Soren Segerberg

FELDE, Imre (Óbuda University)

09:50 [39] An Overview of Researches and Standardization Activities on Test for Quenchant Characterization in Japan

ARIMOTO, Kyoza (Arimotech Ltd.)

10:15 [92] Advanced developments in the field of liquid quenchant's State of technique - New Requirements – Technical Perspectives

BRAUN, Rainer (BU)

Coffee Break (10:40-11:00)

HEAT TREATMENT: Sören SEGERBERG memorial Symposium (11:00-12:40)

Heat Treatment and Surface Engineering in Additive Manufacturing

Session chair: MACKENZIE, Donald (Quaker Houghton Inc.)

11:00 [7] Quenching with Aqueous Polymer Solutions

LÜBBEN, Thomas (Leibniz-IWT, Bremen, Germany)

11:25 [78] Comparison of high-severity quenchant's for low-carbon steels

CAMPOS FRANCESCHINI CANALE, Lauralice (EESC-USP)

11:50 [90] Current Investigations at Quenching Research Centre

LANDEK, Darko (University profesor)

12:15 [41] Characterization of Polymer Quenchant's - Influence of Agitation

MACKENZIE, Donald (Quaker Houghton Inc.)

TBYAA-announcement & Poster Awards & Closing (12:40-12:50)

Lunch (12:50-13:50)

Thursday 08 September 2022

SURFACE ENGINEERING: Low-Temperature Surface Engineering (09:00-10:40)

Surface Hardening, Carburizing, Carbonitriding

Session chair: SOMERS, Marcel (Technical University of Denmark)

09:00 [63] Influence of cold rolling and post annealing on low-temperature gaseous nitriding of meta-stable and nitrogen-stabilized 304 austenitic stainless steel

WANG, Bo (DTU)

09:25 [19] Active-Screen Plasma Nitriding and Carburizing of an Austenitic Stainless Steel Small-Diameter Thin Pipe

SUMIYA, Kenzo (Hatta Kogyo Co. Ltd.)

09:50 [14] Improved fatigue performance of stainless steels by low temperature surface hardening

BAUER, Alexandra

10:15 [58] 'Ultra-low' temperature nitriding of martensitic stainless steels

TIBOLLO, Chiara (Technical University of Denmark)

Coffee Break (10:40-11:00)

HEAT TREATMENT: Furnace equipment & Process Control (11:00-12:40)

Heat Treatment and Surface Engineering in Additive Manufacturing

Session chair: BUCHNER Klaus

11:00 [26] Technological Shift : from mesh-belt furnaces to a clean, compact and automated production

POULOUX, Patrick (ECM Technologies)

11:25 [57] The ISO 20431 standard: a new quality standard for heat treatment workshops

BUVRON, Marc

11:50 [33] Intelligent Heat Treatment with digital Solutions

HEINRICH, Thomas (Bürkert Werke GmbH & Co KG)

12:15 [49] Smart sensors fulfilling the promise of the de-carbonization and IoT

NUJIC, Ivica, SCHERF, Uwe

Lunch (12:50-13:50)

Thursday 08 September 2022

SURFACE ENGINEERING: Induction Heating Symposium
(09:00-10:15)

Surface Hardening, Carburizing, Carbonitriding

Session chair: FORZAN, Michele (University of Padova)

09:00 [38] Induction heating modelling for tempering of low alloy steels

QUEREJETA IRIZAR,
Xabier (Ikerlan)

09:25 [101] Neural Metamodels for the Identification of Driving Parameters of an Induction Heating Process

CIOFANI, Matteo
(University of Padova)

09:50 [109] Inductive heat treatment of high-speed steels

LEITNER, Harald
(voestalpine Böhler
Edelstahl GmbH & CoKG)

Coffee Break (10:40-11:00)

SURFACE ENGINEERING: Induction Heating Symposium
(11:00-12:15)

Surface Hardening, Carburizing, Carbonitriding

Session chair: GOLDSTEIN Robert

11:00 [102] Multi-physics finite element simulations for induction brazing

FORZAN, Michele
(University of Padova)

11:25 [44] Lifetime Enhancement of Induction Heating Coils: A Complex Approach based on Numerical Simulations and 3D-Printing

IVANOV, Dmitry

11:50 [100] Calibration of model for hardening gear wheels

DESISA, Debela (Silesian
University of Technology)

Lunch (12:50-13:50)