MMP

Modelling for Materials Processing

Rīga, September 2017

Programme of the
VIII International Scientific
Colloquium

Modelling for Materials Processing

Rīga, September 21-22, 2017

Organized by

LATVIJAS UNIVERSITĀTE
ANNO 1919

Leibniz Universität Hannover

Scientific Committee

- **E. Baake** Leibniz Universität Hannover, *Germany*
- **V. Bojarevics** University of Greenwich, *United Kingdom*
- **F. Dughiero** University of Padua, *Italy*
- **P. Dold** Fraunhofer CSP, *Germany*
- **V. Fireteanu** Politehnica University of Bucharest, *Romania*
- **A. Jakovics** University of Latvia, *Latvia*
- **B. Nacke** Leibniz Universität Hannover, *Germany*
- **A. Thess** German Aerospace Center (DLR), *Germany*
- **V. Timofejev** Siberian Federal University, *Russian Federation*
- **J. Virbulis** University of Latvia, *Latvia*

Local Organising Committee (University of Latvia)

- **Dr. A. Jakovics,** *Chairman*
- **Dr. J. Virbulis**,
- **Dr. M. Scepanskis**
- **Ms. I. Suija,** *Secretary*

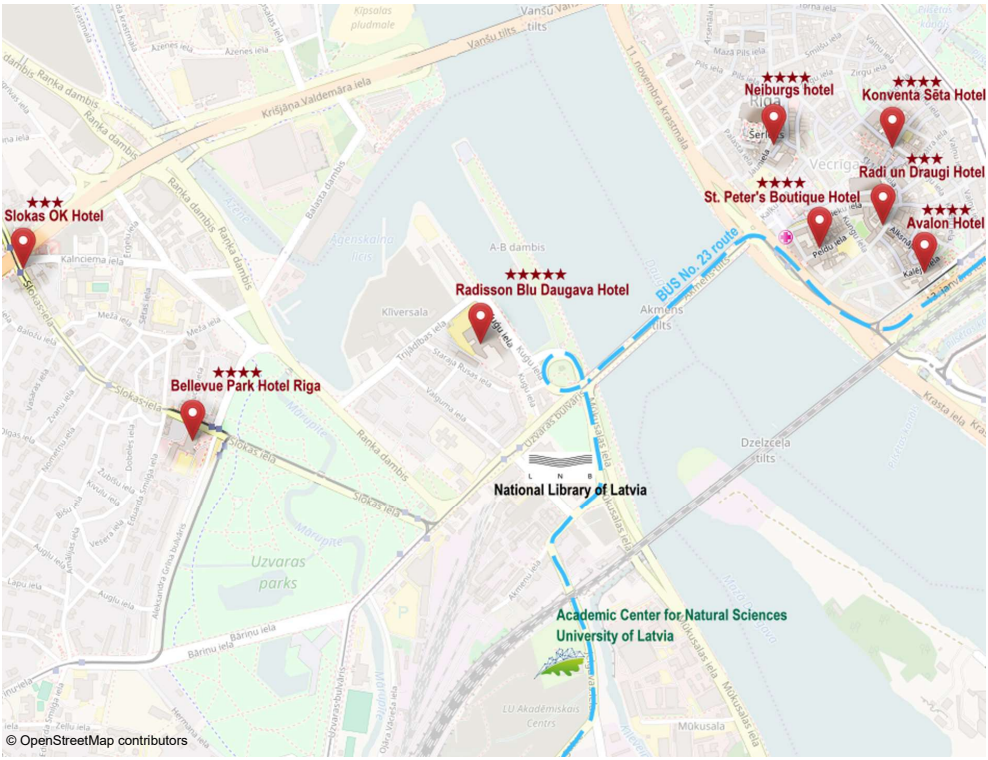
Place and Time

- **Academic Center for Natural Sciences of the University of Latvia**
- **September 21-22, 2017**

The Organising committee gratefully acknowledge the sponsorship and support received from the

Baltic-American Freedom Foundation

Center for the Processes' Analysis and Research



Academic Center for Natural Sciences of the University of Latvia, Jelgavas iela 1, Rīga

Agenda

Wednesday **September 20**	Thursday **September 21**	Friday **September 22**
	08^{30} - 09^{00} Late registration	
	9^{00} - 10^{40} **Opening Session** Chairman: ***Dr. A. Jakovics*** Welcome address and 3 plenary lectures	9^{00} - 10^{30} **"EM Field & Heat Treatment"** Chairman: ***Prof. B. Nacke*** 5 presentations
	10^{40} - 11^{00} Coffee break	10^{30} - 10^{50} Coffee break
	11^{00} - 12^{30} **"Crystal Growth I"** Chairman: ***Prof. J. Derby*** 5 presentations	10^{50} - 12^{20} **"Advanced Applications"** Chairman: ***Dr. V. Geza*** 5 presentations
	12^{30} - 13^{45} Common Photo & Lunch	12^{20} - 13^{20} Lunch
	13^{45} - 15^{15} **"Metallurgical Applications I"** Chairman: ***Prof. E. Baake*** 5 presentations	13^{20} - 14^{50} **"Metallurgical Applications II"** Chairman: ***Dr. Ch. Karcher*** 5 presentations
	15^{15} - 15^{30} Coffee break	14^{50} - 15^{10} Coffee break
	15^{30} - 16^{30} **Poster Session** Chairmans: ***Dr. U. Lüdtke, Prof. J. Barglik*** 11 posters	15^{10} - 16^{40} **"Multiphase Processes"** Chairman: ***Prof. V. Bojarevics*** 5 presentations
	16^{30} - 18^{00} **"Crystal Growth II"** Chairman: ***Dr. J. Virbulis*** 5 presentations	16^{40} - 17^{00} **Prime Poster Award & Closing** 17^{00} - 18^{00} *Guided tour to the Academic Center for Natural Sciences*
19^{00} - 21^{00} Registration & Welcome reception	19^{30} - 22^{30} Colloquium dinner	18^{30} - 20^{30} *Guided sightseeing in Old Riga*

Programme

September 20 *National Library of Latvia, 3 Mūkusalas Str. 11th floor*

19^{00} - 21^{00} **REGISTRATION & WELCOME RECEPTION**

September 21 *Academic Center for Natural Sciences, 1 Jelgavas Str.*

8^{30} - 9^{00} **LATE REGISTRATION**

9^{00} - 10^{40} **OPENING SESSION & PLENARY LECTURES**

Chairman: ***Dr. A. Jakovics***

I. Muiznieks, *Rector, University of Latvia*
Welcome address

J. J. Derby
The Synergy of Modelling and Novel Experiments for Melt Crystal Growth Research

V. Bojarevics, A. Tucs
Large Scale Liquid Metal Batteries

S. Spitans, H. Franz, E. Baake
Numerical Aspects of Multiphysical Modelling in ANSYS

10^{40} - 11^{00} **COFFEE BREAK**

11^{00} - 12^{30} **CRYSTAL GROWTH I**

Chairman: ***Prof. J. Derby***

K. Dadzis, R. Menzel, M. Ziem, T.Turschner, H. Riemann, N.V. Abrosimov
High-frequency Heat Induction Modeling for a Novel Silicon Crystal Growth Method

K. Surovovs, M. Plāte, J. Virbulis
The Modelling of Phase Boundaries and Melt Flow in the Crucible-free Silicon Crystal Growth Using High-frequency Induction Heating

C. Stelian, T. Duffar
Modeling Czochralski Growth of Oxide Crystals for Piezoelectric and Optical Applications

J. Seebeck, K. Dadzis, P. Bönisch, J. Friedrich, L. Sylla
Modelling of Industrial Czochralski Processes for Photovoltaic Applications

A. Sabanskis, J. Virbulis
Modelling of Thermal Field and Point Defect Dynamics During Silicon Single Crystal Growth Using CZ Technique

12^{30} - 13^{45} **COMMON PHOTO & LUNCH**

13^{45} - 15^{15} **METALLURGICAL APPLICATIONS I**

Chairman: ***Prof. E. Baake***

S. Spitans, H. Franz, E. Baake, A. Jakovics
Large-scale Levitation Melting and Casting of Titanium Alloys

S. Renaudière de Vaux, R. Zamansky, W. Bergez, P. Tordjeman, V. Bouyer, J.F. Haquet
Influence of Skin Depth on Convective Heat Transfer in Induction Heating

E. Baake, T. Steinberg, S. Spitans
Multi-physical Numerical Modelling of Remelting Processes in a Double Layer Metal Compositions

R. Przylucki , S. Golak, P. Bulinski, J. Smolka, M. Palacz, G. Siwiec, J. Lipart, L. Blacha
Analysis of the Impact of Modification of Cold Crucible Design on the Efficiency of the Cold Crucible Induction Furnace

J. Vencels, A. Jakovics, V. Geza
Simulation of 3D MHD with Free Surface Using Open-source EOF-library

15^{15} - 15^{30} **COFFEE BREAK**

15^{30} - 16^{30} **POSTER SESSION**

Chairmans: ***Prof. J. Barglik, Dr. U. Lüdtke***

E. Shvydkiy, S. Sarapulov, V. Zaharov, K. Bolotin, I. Smolyanov
Numerical Modelling of Traveling Magnetic Field Stirrer for Liquid Lithium

S. Ivanov, D. Zablockis
A Feasibility Study for High-temperature Titanium Reduction from TiCl4 Using a Magnesiothermic Process

J. Barglik, A. Smagór
Mathematical Modeling of Induction Stirring of Liquid Metal in Crucible Furnace

A. Brēķis, J.E. Freibergs, A. Gailītis, A. Alemany
New Experimental Results from Testing „Space Trips" Facility of Thermoacoustic System Coupled with Magnetohydrodynamic Generator

K. Bergfelds, A. Sabanskis, J. Virbulis
Implementation of Small-scale Laboratory Crystal Growth Furnace for the Development of Mathematical Model for Large-scale Industrial CZ Process

M. Plāte, A. Krauze, J. Virbulis
Three-dimensional Modelling of Interface Shapes and Thermal Stress in Floating Zone Silicon Crystal Growth

A. Krauze, V. Silamiķelis
Mathematical Modeling of Holding Melting Zone with LF and HF EM Fields in Floating Zone Crystal Growth Facilities

G. Chikvaidze, A. Kravtsov
Detection of Trace Copper Impurities in Silicon Using Low-temperature FTIR-spectroscopy

V. Geža, A. Jakovičs, S. Gendelis, I. Usiļonoks
Modelling of Granule Filling in Wall Gap for Estimation of Role of Thermal Convection

I. Barmina, A. Kolmičkovs, R. Valdmanis, S. Vostrikovs, M. Zake
Combustion Dynamics of Biomass Mixtures with Microwave Pre-processing of Pellets

T. Steinberg, T. Opitz, A. Rybakov, E. Baake
Comparison of the Electromagnetic and Marangoni Forces on Thin Coatings During Rapid Heating Process

16^{30} - 18^{00} **CRYSTAL GROWTH II**

Chairman: ***Dr. J. Virbulis***

F. Zobel, F. Mosel, J. Sørensen, P. Dold
Aspects of RF-heating and Gas-phase Doping of Large Scale Silicon Crystals Grown by the Float Zone Technique

S. Kayser, A. Lüdge, K. Böttcher
Computational Simulations of the of Lateral-Photovoltage-Scanning - Method

V. Geža, J. Venčels, Ģ. Zāģeris, S. Pavlovs
Numerical Modelling of Surface Waves Generated by Low Frequency Electromagnetic Field for Silicon Refinement Process

A. Kravtsov
Development of Silicon Growth Techniques from a Melt with Surface Heating

A. Krauze, J. Virbulis, A. Kravtsov
Modeling Electron Beam Parameters and Plasma Interface Position in an Anode Plasma Electron Gun with Hydrogen Atmosphere

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19^{30} - 22^{30} **COLLOQUIUM DINNER**

Hotel "Bergs", 83/85 Elizabetes Str.

September 22 *Academic Center for Natural Sciences, 1 Jelgavas Str.*

9^{00} - 10^{30} **EM FIELD & HEAT TREATMENT**

Chairman: ***Prof. B. Nacke***

M. Ščepanskis, V. Geža, R. Viļums
Connecting Engineering Open Source Software: New Horizon of Modeling Opportunities

A. Dietrich, B. Nacke
Numerical Investigation of Effects on Blanks for Press Hardening Process during Longitudinal Flux Heating

J. Barglik, K. Ducki, D. Kukla, J. Mizera, G. Mrowka-Nowotnik, J. Sieniawski, A. Smalcerz
Comparison of Single and Consecutive Dual Frequency Induction Surface Hardening of Gear Wheels

M. Baldan, T. Steinberg, E. Baake
Self-Adaptive Multimethod Optimization Search Applied to a Tailored Heating Forging Process

M. Birjukovs, A. Jakovičs, W. Holweger
Modelling of Thermal Stresses in Bearing Steel Structure Generated by Electrical Current Impulses

10^{30} - 10^{50} **COFFEE BREAK**

10^{50} - 12^{20} **ADVANCED APPLICATIONS**

Chairman: ***Dr. V. Geza***

T. Kozuka, S. Fukuda
Effect of Magnetic Field on Anodized Oxide Film without Dielectric Breakdown

H. Kalis, M. Marinaki, L. Ozola, U. Strautins, I. Barmina, M. Zake
Mathematical Modelling on Electromagnetic Field Control of the Combustion Process

B. Halbedel, O. Kazak
Development of Electromechanical Principle for Wet and Dry Milling

E. Blumbergs, V. Kagalnickovs, E. Platacis, D. Zablockis
Insight at Electroslag Process for Better Morphology of Titanium Deposits

G. Zageris, V. Geza, A. Jakovics
Numerical Investigation of Slag Formation in an Entrained-flow Gasifier

12^{20} - 13^{20} **LUNCH**

13^{20} - 14^{50} **METALLURGICAL APPLICATIONS II**

Chairman: ***Dr. Ch. Karcher***

F. Sarapulov, I. Smolyanov, F. Tarasov, K. Bolotin, E. Shvydkiy
Numerical Simulation of Double Side Linear Induction Pump for Liquid Magnesium

A. Chudnovsky
Physical Modelling of 3D Melts Mixing for Electrometallurgical Aggregates

A. Bojarevičs, I. Kaldre, M. Milgrāvis, T. Beinerts
Direct Chill Casting of Aluminium Alloys under Electromagnetic Interaction

U. Lüdtke, N. Tran Thi Hang
Numerical Simulation of Channel Induction Furnace to Investigate Efficiency for low Frequencies

K.E. Bolotin, I.A. Smolyanov, E.L. Shvidkiy, V.E. Frizen, S.A. Bychkov
Numerical Simulation of Electromagnetic Stirrer Modernized by Using a Magnetodielectric Composite

14^{50} - 15^{10} **COFFEE BREAK**

15^{10} - 16^{40} **MULTIPHASE PROCESSES**

Chairman: ***Prof. V. Bojarevics***

R. Guichou, P. Tordjeman, W. Bergez, R. Zamansky, K. Paumel
Experimental Study of Bubble Detection in Liquid Metal

Ch. Karcher, D. Hernández
Dynamics of Falling Liquid Metal Droplets and Jets Influenced by a Strong Axial Magnetic Field

N. Tran, U. Lüdtke
Numerical Simulation of Two-phase Liquid Metal Interacting with Strongly Inhomogeneous Magnetic Fields

Z. Lyu, Ch. Karcher, A. Thess
Lorentz Force Velocimetry Applied to Liquid Metal Two-phase Flow

V. Dzelme, M. Sarma, A. Jakovics, K. Thomsen

Modelling of Rotating Permanent Magnet Induced Liquid Metal Stirring

16^{40} - 17^{00} **PRIME POSTER AWARD & CLOSING OF COLLOQUIUM**

17^{00} - 18^{00} **GUIDED TOUR TO THE ACADEMIC CENTER FOR NATURAL SCIENCES**

1 Jelgavas Str.

18^{30} - 20^{30} **GUIDED SIGHTSEEING IN OLD RIGA**

Gathering at University of Latvia,19 Raina Blvd.

September 23 *Excursion to the seaside town Jūrmala*

Useful information

Reference address and contact information

Laboratory for Mathematical Modelling
of Environmental and Technological Processes (LMMETP), University of Latvia
23 Zellu Str., Riga, LV-1002, Latvia
Tel.: +371-67033780, www.modlab.lv, modlab@modlab.lv

Proceedings

The full text of all the papers (oral and poster) will be published in the Colloquium Proceedings and issued to delegates when they register at the Registration Desk. Extra copies can be bought at the Registration Desk or ordered by the LMMETP at the price of 15 EUR.
Selected papers after colloquium will be published in the scientific journal „Magnetohydrodynamics" or in an open access journal IOP conference series "Material science and Engineering".

Registration

Registration of participants will take place on September 20 at National Library of Latvia (3 Mūkusalas Str., 11th floor) between 19:00 and 21:00. Late registration can be done at Academic Center for Natural Sciences of the University of Latvia (1 Jelgavas Str., ground floor) on September 21 from 8:30.

Welcome reception

All participants and accompanying persons are invited to a welcome reception on September 20 from 19:00 at National Library of Latvia (3 Mūkusalas Str.).

Lunches

Buffet lunches and coffee breaks for registered participants are included in the conference fee.

Dinner

The dinner (included in conference fee) will take place in the Hotel "Bergs", (83/85 Elizabetes Str.), on September 21 at 19:30. Price for accompanying persons – 100 EUR.

Public transport to the conference location

Academic Center for Natural Sciences of University of Latvia can be reached from the city center by bus No. 23 (bus stop "*LU Akadēmiskais centrs*").
https://saraksti.rigassatiksme.lv/index.html#bus/23/a-b/7749b/map/en

Tourism information about Riga and Latvia

www.latvia.travel www.liveriga.com www.inyourpocket.com/riga

Guidelines for presentation

Oral presentations

Time for each presentation including discussion is limited by 18 (15+3) minutes and 30 (25+5) minutes for plenary lectures.
The projector (PowerPoint) and PC will be available for oral presentations.

Poster presentations

The place for the posters (with maximum size up to A0) will be available near the conference room. You are kindly asked to attach posters during the first coffee break on September 21. Adhesive tapes will be provided. Contact the organisers in advance if special equipment is required.
Poster session is scheduled on September 21 from 15:30 to 16:30. The best poster will be awarded.