

Program of the IX International Scientific  
Colloquium

# Modelling for Materials Processing

Riga, September 18-19, 2023

Organized by



**LATVIJAS**  
**UNIVERSITĀTE**  
ANNO 1919



Leibniz  
Universität  
Hannover

## Scientific Committee

<b>E. Baake</b>	<b>Leibniz University Hannover, Germany</b>
<b>V. Bojarevics</b>	<b>University of Greenwich, United Kingdom</b>
<b>O. Budenkova</b>	<b>INP Grenoble/CNRS, France</b>
<b>L. Buligins</b>	<b>University of Latvia, Latvia</b>
<b>F. Dughiero</b>	<b>University of Padua, Italy</b>
<b>K. Dadzis</b>	<b>Leibniz-Institute for Cristal Growth, Germany</b>
<b>S. Eckert</b>	<b>Helmholz-Center Dresden-Rossendorf, Germany</b>
<b>A. Jakovičs</b>	<b>University of Latvia, Latvia</b>
<b>B. Nacke</b>	<b>Leibniz University Hannover, Germany</b>
<b>J. Priede</b>	<b>University of Latvia, Latvia/University of Greenwich, United Kingdom</b>
<b>J. Virbulis</b>	<b>University of Latvia, Latvia</b>

## Local Organising Committee (University of Latvia)

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

## Place and Time

- **Academic Center for Natural Sciences of the University of Latvia, Jelgavas street 3, Rīga**
- **September 18-19, 2023**

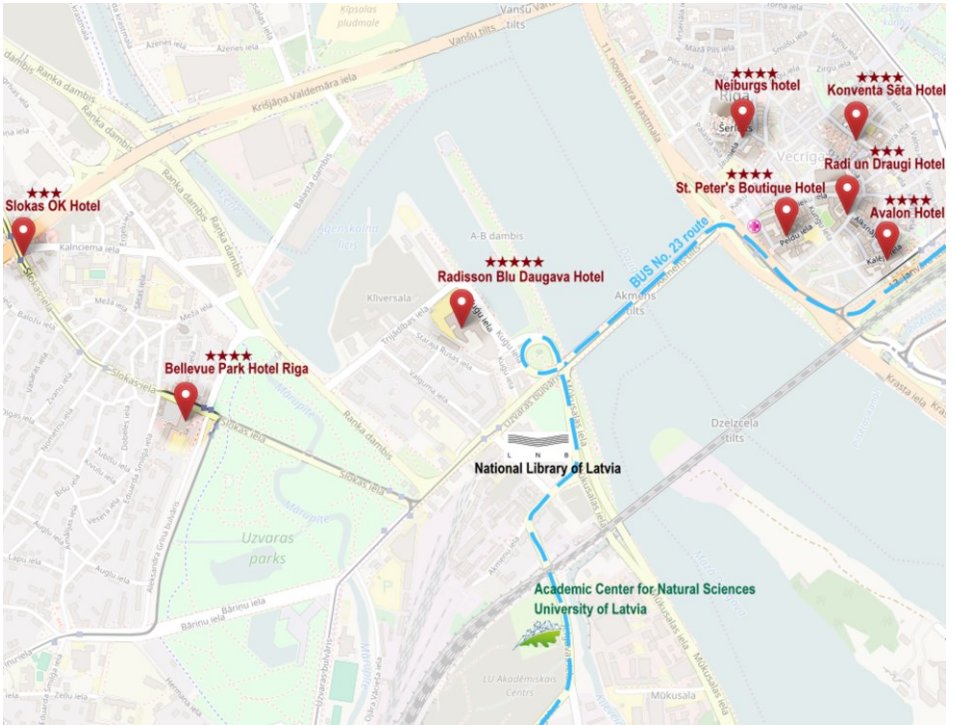
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Academic Center for Natural Sciences of the University of Latvia, 3 Jelgavas str., Riga

# Agenda

Sunday September 17	Monday September 18	Tuesday September 19
19 <sup>00</sup> - 21 <sup>00</sup> Registration & Welcome party	08 <sup>30</sup> - 09 <sup>00</sup> Late registration	
	9 <sup>00</sup> - 10 <sup>40</sup> <b>Opening Session</b> Chairman: <b>Prof. J. Priede</b> Welcome address and 3 plenary lectures	9 <sup>00</sup> - 10 <sup>40</sup> <b>ADVANCED TECHNOLOGIES</b> Chairman: <b>Dr. I. Kaldre</b> 5 presentations
	10 <sup>40</sup> - 11 <sup>00</sup> Coffee break	10 <sup>40</sup> - 11 <sup>00</sup> Coffee break
	11 <sup>00</sup> - 12 <sup>40</sup> <b>MHD TECHNOLOGIES I</b> Chairman: <b>Prof. V. Bojarevics</b> 5 presentations	11 <sup>00</sup> - 12 <sup>40</sup> <b>CRYSTALLIZATION</b> Chairman: <b>Dr. K. Dadzis</b> 5 presentations
	12 <sup>40</sup> - 14 <sup>00</sup> Common Photo & Lunch	12 <sup>40</sup> - 13 <sup>40</sup> Lunch
	14 <sup>00</sup> - 15 <sup>40</sup> <b>Crystal Growth</b> Chairman: <b>Dr. J. Virbulis</b> 5 presentations	13 <sup>40</sup> - 15 <sup>20</sup> <b>NUMERICAL MHD</b> Chairman: <b>Dr. A. Kao</b> 5 presentations
	15 <sup>40</sup> - 16 <sup>00</sup> Coffee break	15 <sup>20</sup> - 15 <sup>40</sup> Coffee break
	16 <sup>00</sup> - 17 <sup>00</sup> <b>PhD Student Presentations</b> Chairman: <b>Prof. J. Priede</b> 3 presentations	15 <sup>40</sup> - 17 <sup>20</sup> <b>MHD TECHNOLOGIES II</b> Chairman: <b>Dr. A. Jakovics</b> 5 presentations
	16 <sup>00</sup> - 18 <sup>00</sup> <b>Poster Session</b> Chairman: <b>Prof. E. Baake</b> 13 posters	17 <sup>20</sup> - 17 <sup>40</sup> <b>Prime Poster Award &amp; Closing</b>
	19 <sup>00</sup> - 22 <sup>00</sup> Colloquium dinner	

# Program

<b>September 17</b>		<i>University of Latvia, Academic Center for Natural Sciences, 3 Jelgavas str., 7<sup>th</sup> floor</i>
19 <sup>00</sup> - 21 <sup>00</sup>	<b>REGISTRATION &amp; WELCOME PARTY</b>	
<b>September 18</b>		<i>University of Latvia, Academic Center for Natural Sciences, 3 Jelgavas str., ground floor</i>
8 <sup>30</sup> - 9 <sup>00</sup>	<b>LATE REGISTRATION</b>	
9 <sup>00</sup> - 10 <sup>40</sup>	<b>OPENING SESSION &amp; PLENARY LECTURES</b> <i>Chairman: Prof. J. Priede</i>	
	<b>Welcome address</b>  S. Eckert <b>How magnetic field measurements can be applied to characterise flow structures in liquid metals or to monitor electrified industrial processes</b>  V. Bojarevics <b>MHD effects on the alumina dissolution in aluminium electrolysis cells</b>  K. Dadzis, A. Wintzer, I. Tsiapkinis, S. Foroushani <b>Multiphysical model experiments for crystal growth from melt</b>	
10 <sup>40</sup> - 11 <sup>00</sup>	<b>COFFEE BREAK</b>	
11 <sup>00</sup> - 12 <sup>40</sup>	<b>MHD TECHNOLOGIES I</b>  <i>Chairman: Prof. V. Bojarevics</i>	
	E. Baake, M. Guglielmi, A. Köppen, E. Holzmann, S. Herbst <b>Innovative NbSi composites: investigation and development of an alloying process using cold crucible induction furnace</b>  C. E.H. Tonry, V. Bojarevics, G. Djambazov, K. Pericleous <b>Modelling contactless ultrasonic cavitation for industrial scaling</b>  N. Jēkabsons, L. Goldšteins, L. Buligins, K. Kravalis	

	<p><b>Results of 3D simulations of electromagnetic induction pump using electric potential formulation</b></p> <p>V. Dzelme, A. Jakovičs, E. Baake <b>Electromagnetic control of the direct strip casting process</b></p> <p>S. Spitans, H. Franz, B. Sehring, S. Bogner <b>Advanced electrode melting for highest purity cast parts</b></p>
12 <sup>30</sup> – 14 <sup>00</sup>	<b>COMMON PHOTO &amp; LUNCH</b>
14 <sup>00</sup> – 15 <sup>40</sup>	<p><b>CRYSTAL GROWTH</b></p> <p style="text-align: right;"><i>Chairman: Dr. J. Virbulis</i></p>
	<p>L. Vieira, I. Tsiapkinis, K. Dadzis, R. Menzel <b>Numerical model for growth of crystalline silicon fibers needed in 3<sup>rd</sup> generation gravitational wave detectors</b></p> <p>A. Sabanskis, K. Dadzis, A. Wintzer, J. Virbulis <b>New open-source software for simulation of thermal stresses and dislocations in crystals during the growth process</b></p> <p>I. Tsiapkinis, A. Wintzer, S. Foroushani, K. Dadzis <b>Validation of high-frequency electromagnetic models for crystal growth applications</b></p> <p>K. Kalme, A. Sabanskis, J. Virbulis <b>Experimental and numerical investigation of LiBr crystal growth using the CZ method</b></p> <p>M. Hainke, M. Lang, S. Krishna Tangedipelli, Ch. Kranert, J. Friedrich <b>Simulation-driven process development of AlN-single crystal growth by the physical vapor transport method</b></p>
15 <sup>40</sup> – 16 <sup>00</sup>	<b>COFFEE BREAK</b>
16 <sup>00</sup> – 17 <sup>00</sup>	<p>PhD-Students Presentations (3)</p> <p style="text-align: right;"><i>Chairman: Prof. J. Priede</i></p>
16 <sup>00</sup> – 18 <sup>00</sup>	<p><b>POSTER SESSION (12)</b></p> <p style="text-align: right;"><i>Chairman: Prof. E. Baake</i></p>
	K. Surovovs, S. Stroževs, M. Surovovs, J. Virbulis

**Effect of dopant boundary conditions on crystal resistivity during floating zone growth of silicon crystals**

I. Tsiapkinis, A. Wintzer, S. Foroushani, K. Dadzis  
**Ultrasonic Doppler velocimetry for melt flow in model experiments for Czochralski crystal growth**

M. Surovovs, J. Virbulis  
**Numerical modelling of feed rod melting dynamics during floating zone silicon crystal growth**

S. Pavlovs, A. Jakovics, A. Chudnovsky  
**Numerical study of heating and melting of metal in industrial direct current electrical arc furnace**

R. Strazdiņš, L. Terlizzi, L. Goldšneins  
**Power calculation in a 2D axisymmetric centrifugal separator with traveling magnetic field**

A. Jegorovs, M. Birjukovs, A. Jakovics  
**Optical imaging of MHD bubble flow in a Hele-Shaw liquid metal cell**

Ling Shi, Jiang Wang, Songzhe Xu\*, Jingjing Li, Chaoyue Chen, Tao Hu, Hari Sundar, Zhongming Ren  
**A well coupled multi-scale model of additive manufacturing based on phase field method, cellular automata method and lattice Boltzmann method**

V. Geza, K. Bolotin  
**Finite element method calculations coupled with circuit simulator**

B. Jirgensone  
**Numerical analysis of condensation risk in different multilayer building structures**

Ģ. Zāģeris, V. Geža  
**Numerical modeling of silicon melt purification with gas blowing: a model description**

S. Mingozzia, M. Iafratic  
**Modelling liquid metal free-surface capillary flow for nuclear fusion applications**

A. Brēķis, A. Šiško, I. Buceniekš

	<p><b>Magnetic field distribution in disc-type electromagnetic pump with permanent magnets</b></p> <p>V. Dzelme, V. Geza, V. Kharitonov  <b>Simulation of autothermal reforming of methane in a packed-bed reactor</b></p>
19 <sup>00</sup> – 22 <sup>00</sup>	<p><b>COLLOQUIUM DINNER</b></p> <p>Café “Annas dārzs” (44 Mūkusalas str.)</p>
<p><b>September 19</b>     <i>Academic Center for Natural Sciences, 3 Jelgavas Str.</i></p>	
9 <sup>00</sup> – 9 <sup>40</sup>	<p><b>ADVANCED TECHNOLOGIES</b></p> <p style="text-align: right;"><i>Chairman: Dr. I. Kaldre</i></p>
	<p>N. Sufis, I. Niedzwiecki, A. Nikanorov, E. Baake  <b>Experimental and simulative studies on the electrothermal behavior of carbon fiber resistive heating elements</b></p> <p>K. Kokars, A. Krauze, K. Muižnieks, J. Virbulis, J. Oliņš,  A. Gutcaits, P. Verners  <b>Density-based topological optimization of 3D-printed casts for fracture treatment with FreeFem software</b></p> <p>I. Niedzwiecki, A. Nikanorov, E. Baake, N. Sufis  <b>Inverse identification of SMC material properties - innovative implementation of flux concentrator losses in numerical design of inductive systems</b></p> <p>I. Ušakovs  <b>Porous material for gas thermal compression in space conditions. Thermal design aspects</b></p> <p>S. Sakipova, B. Nussupbekov, K. Shaimerdenova,  D. Ospanova, B. Kutum  <b>Analysis of the heat-exchangers energy efficiency of variable cross section with an inhomogeneous coolant</b></p>
10 <sup>40</sup> – 11 <sup>00</sup>	<p><b>COFFEE BREAK</b></p>
11 <sup>00</sup> – 12 <sup>40</sup>	<p><b>CRYSTALLIZATION</b></p> <p style="text-align: right;"><i>Chairman: Dr. K. Dadzis</i></p>
	<p>M. Forzan, M. Guglielmi  <b>Directional solidification of silicon: experimental results</b></p>



	<p>B. Hiba, Ab. Nouri, L. Hachani, K. Zaidat  <b>Numerical study of the Bridgman directional solidification process of photovoltaic silicon ingot using the power control technique</b></p> <p>N. Shevchenko, Q. Bai, A. Kao, S. Eckert  <b>Pulsed electromagnetic field effects on dendritic solidification in a thin cell</b></p> <p>P. Soar, A. Kao, K. Pericleous  <b>Incorporating interdependent structural mechanical mechanisms into modelling three-dimensional microstructure solidification</b></p> <p>F. Zobel, P. Dold  <b>300 mm silicon mono Czochralski crystals: parameters and conditions for crystal growth</b></p>
12 <sup>40</sup> – 13 <sup>40</sup>	<b>LUNCH</b>
13 <sup>40</sup> – 15 <sup>20</sup>	<b>NUMERICAL MHD</b>  <i>Chairman: Dr. A. Kao</i>
	<p>D. Berenis, I. Grants, L. Buligins  <b>Surface deformations of liquid metal flow in porous media in external uniform magnetic field</b></p> <p>E. Shvydkii, E. Hepp, J. Fainberg  <b>Continuous casting simulation with MAGMASOFT®</b></p> <p>M. Al-Nasser, H. Barati, E. Karimi-Sibaki, M. Wu, Ch. Redl, A. Ishmurzin, N. Voller, G. Hackl, A. Kharicha  <b>Influence of external magnetic field on 3D electro vortex flow inside conducting liquids</b></p> <p>V. Giovacchini, S. Mingozi  <b>Modeling of magnetohydrodynamics in liquid metals with a free surface using OpenFOAM</b></p> <p>H. Barati, M. Wu M, A. Kharicha, A. Ludwig  <b>Simulation of melt flow in steel continuous casting considering transient clogging of submerged entry nozzle</b></p>
15 <sup>20</sup> – 15 <sup>40</sup>	<b>COFFEE BREAK</b>
15 <sup>40</sup> – 17 <sup>20</sup>	<b>MHD TECHNOLOGIES II</b>

	<i>Chairman: Dr. A. Jakovics</i>
	<p>A. Vakhrushev, A. Kharicha, E.Karimi-Sibaki, M. Wu, A. Ludwig, G. Nitzl, Y. Tang, G. Hackl, J. Watzinger  <b>Influence of the rotational component of a submerged entry nozzle jet on the free surface oscillations under the applied DC magnetic field</b></p> <p>A. Kao, X. Fan, N. Shevchenko, C. Tonry, P. Soar, I. Krastins, S. Eckert, K. Pericleous, P. D. Lee  <b>Thermoelectric magnetohydrodynamic control in alloy solidification</b></p> <p>M. Sarma, C. Duczek, W. Nash, N. Weber, T. Weier  <b>Mass transport and solutal convection in a sodium-zinc molten salt battery with liquid electrolyte: comparison of modelling and experiments</b></p> <p>I. Kaldre, V. Felcis  <b>Role of thermoelectromagnetic effect in metal additive manufacturing</b></p> <p>L. Terlizzi, R. Strazdiņš, L. Goldšteins  <b>Modelling azimuthal velocity of liquid metal in a 2D centrifugal separator driven by a travelling magnetic field</b></p>
17 <sup>20</sup> – 17 <sup>40</sup>	<b>PRIME POSTER AWARD &amp; CLOSING OF COLLOQUIUM</b>

## Useful information

### Reference address and contact information

Institute of Numerical Modelling, University of Latvia  
3 Jelgavas str., Riga, LV-1002, Latvia  
[www.modinst.lv](http://www.modinst.lv)  
e-mail:epm2023@lu.lv

### Proceedings and publications

The full texts or abstracts of all the papers (oral and poster) will be published in the Colloquium Proceedings online (assessable via conference webpage).  
After the conference, selected papers will be published in SCOPUS indexed scientific journals „Magnetohydrodynamics”, “Crystals” or “Latvian Journal of Physical and Technical Sciences”.

## **Registration**

Registration of participants will take place on September 17 at the 7-th floor in University building 3 Jelgavas str. between 19:00 and 20:00. Late registration can be done at the Academic Center for Natural Sciences of the University of Latvia (3 Jelgavas str., ground floor) on September 18 from 8:30.

## **Welcome party**

All participants and accompanying persons are invited to a welcome party on September 17 at 19:00 (7-th floor in University building 3 Jelgavas str.).

## **Lunches**

Buffet lunches and coffee breaks for the registered participants are covered by the conference fee.

## **Dinner**

The dinner (covered by the conference fee) will take place in the Café “Annas dārzs” (44 Mūkusalas str.) on September 18 at 19:00. The price for accompanying persons is 100 EUR.

## **Excursion**

The excursion to the Rundāle palace for previously registered participants will start on September 17 at 9:00 from University building 3 Jelgavas str. Short stop by the Bauska castle is foreseen. Return time to Riga is approximately 17:30.

## **Guidelines for presentation**

### **Oral presentations**

The time for each presentation, including discussion, is limited to 20 (15+5) minutes and to 30 (25+5) minutes for plenary lectures. Windows PC will be available for oral presentations.

### **Presentations of PhD-Course participants**

The results of PhD-Students project-work will be presented in special session on September 18. The time for each presentation, including discussion, is limited to 20 (16+4) minutes.

### **Poster presentations**

The place for the posters (with a maximum size up to A0) will be available near the conference room. You are kindly asked to attach posters during the lunch time on September 18. Adhesive tapes will be provided. Contact the organizers in advance if special equipment is required. Template of posters will be sent to the poster presenters and is accessible also on the conference webpage.

The poster session is scheduled on September 18 from 16:00 to 18:00. The short presentation of posters (till 3 minutes) is foreseen from 17:00. The best poster will be awarded.

### **Public transport to the conference location**

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

### **Tourism information about Riga and Latvia**

[www.latvia.travel](http://www.latvia.travel)

[www.liveriga.com](http://www.liveriga.com)

[www.inyourpocket.com/riga](http://www.inyourpocket.com/riga)

## Remarks