

EPM2021 conference



Conference Program

Riga, June 14-16, 2021 (Online)

Message from the organizers

We are delighted to organize the 10th Electromagnetic Processing of Materials conference. Organization process of this event was not easy, and we were forced to change concept of the conference several times and finally came to the solution that conference will be held fully online. Of course, such format has limitations, but we believe that it was better decision than to cancel the conference completely or to move it to the next year. We have received around 70 abstracts, which is sufficient cover three conference days.

We are looking forward to meet You in the EPM2021 conference.

Local organizing committee

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Leonīds Buligins	University of Latvia	Latvia	Chairman of the EPM2021
Gunter Gerbeth	Helmholtz-Zentrum Dresden-Rossendorf	Germany	Co-Chairman of the EPM2021
Yves Fautrelle	Grenoble Polytechnic Institute	France	Co-Chairman of the EPM2021

Selected articles will be published in peer reviewed journals **Magnetohydrodynamics** special EPM2021 issue

or **IOP conference series**.

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"University of Latvia and institutes in the European Research Area - Excellency, activity, mobility, capacity"

International Advisory Board of EPM2021

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Alban Potherat	Coventry University	UK
Sergei Galunin	Saint Petersburg Electrotechnical University	Russia

EPM2021 conference topics

1. Fundamentals of EPM, MHD, theory & modeling
2. Induction heating, plasma processing & related heat treatment
3. Electromagnetic melting and heating
4. EM shaping or forming, mixing, magnetic or EM levitation
5. Liquid metal processing: steel, aluminum, titanium, copper, magnesium, alloys
6. Solidification, crystal growth under external fields
7. Advanced materials processing in static or alternating magnetic fields
8. Other processes under external fields, electrochemistry, magnetic, electric, electrostatic, microwaves
9. Measuring techniques in liquid metal flows and nondestructive control/wireless energy transfer (by induction)
10. Equipment for EPM, EM pumps, EM brakes, EM stirrers, power sources
11. Low electrical conductivity liquid processing, oxides, glasses, electrolytes
12. Recycling by EM processes
13. MHD for light metal metallurgy

June 14 (Mon) - Opening, Scientific sessions, Advisory Bord meeting

June 15(Tue) – Scientific sessions, Poster session

June 16 (Wed) - Scientific sessions, Closing

Program

Riga, time (EES-Eastern Europe time zone)

Monday, June 14

9:00-9:50	Opening of the EPM conference		
10:00-11:30	Session 1: Induction heating, plasma processing & related heat treatment. Chairman: Valdis Bojarevics		
10:00-10:30	1 Keynote	Numerical investigation of electromagnetic non-linear effects in high frequency longitudinal tube-welding systems	Egbert Baake A. Nikanorov W. Ebel
10:30-10:50	2	Induction heating processes error estimators for electromagnetic computational models	Francois Bay J.O. Garcia J. Alves J. Barlier
10:50-11:10	3	Design of induction tempering of surface hardened components	Bernard Nacke M. Baldan
11:10-11:30	4	Numerical study of the dislocation density dynamics in a silicon crystal heating experiment	Andrejs Sabanskis K. Dadzis H.-J. Rost et al.

11:50-13:20	Session 2: Liquid metal flow control by magnetic fields Chairman: Bernard Nacke		
11:50-12:20	5 Keynote	Influence of horizontal magnetic fields on liquid metal convection	J. Yang F. Schindler T. Vogt Sven Eckert
12:20-12:40	6	Optimization of an electromagnetic stirring process by pulsed travelling magnetic field	Mattia Guglielmi E. Baake I. Niedzwiecki N. Sufis
12:40-13:00	7	Numerical simulation of Stokes' second problem affected by magnetic field	H. Ennayar Christian Karcher Th. Boeck

13:00-13:20	8	Electrovortex flow in a hemisphere under external magnetic field: linear and non-linear cases	Evgeny Mikhailov K. Malyshev I. Teplyakov
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13:20-14:00 Lunch break

14:00-15:30	Session 3: Solidification under external electric and magnetic fields Chairman: Leonids Buligins		
14:00-14:30	9 Keynote	The effect of magnetic fields in freckle evolution during solidification	Natalia Shevchenko Andrew Kao X. Fan et al.
14:30-14:50	10	The effect of electromagnetic stirring on the solidification process of pure Tin: 3D numerical simulation and experimental analysis	Ibrahim Sari B. Hiba Ab. Nouri et al.
14:50-15:10	11	3D numerical simulation and experimental investigations of benchmark experiment of Sn-10 wt.% Pb alloy solidification under forced convection by an alternative electromagnetic stirring.	Abdelhakem Abdelhafidh Ab. Nouri L. Hachani et al.
15:10-15:30	12	Altered phase transformation kinetics of Mn ₃ Ga in a static magnetic field	Gloria Kirste C.G.F. Blum J. Freudenberger et al.

15:50-17:40	Session 4: Multiphase MHD flows Chairman: Andris Jakovics		
15:50-16:20	13 Keynote	Image processing methods for neutron and X-ray radiography of liquid and solidified metals	Mihails Birjukovs P. Trtik A. Kaestner et al.
16:20-16:40	14	MHT-X: Efficient multiple hypothesis tracking for multiphase flow analysis	Peteris Zvejnieks Mihails Birjukovs M. Klevs et al.
16:40-17:00	15	Simulation of binary alloy columnar solidification in the presence of EM driven flow	Evgeniy Shvydkiy I. Smolyanov E. Baake
17:00-17:20	16	Experimental modelling of permanent magnet stirrer for aluminum degassing	Reinis Baranovskis D. Berenis I. Grants et al.
17:20-17:40	17	Dynamic mode decomposition of MHD bubble chain flow	M. Klevs Mihails Birjukovs P. Zvejnieks A. Jakovics

18.00-19.00 - International Advisory Board meeting

Tuesday, June 15

9:00-10:30	Session 5: EM forming, mixing, EM levitation Chairmen: Andrew Kao		
9:00-9:30	18 Keynote	Development of advanced cold crucible melting techniques	Valdis Bojarevics T. Nishimura D. Matsuwaka
9:30-9:50	19	Design of a coil for electromagnetic levitation: comparison of numerical models and coil realization	Romain Pons A. Gagnoud D. Chaussende O. Budenkova
9:50-10:10	20	Electromagnetic forming of a liquid metal layer	Valters Dzelme A. Jakovičs E. Baake
10:10-10:30	21	Analyzing a modulated electromagnetic $m=2$ forcing and its capability to synchronize the Large Scale Circulation in a Rayleigh-Bénard cell of aspect ratio $\Gamma=1$	Sebastian Röhrborn P. Jüstel P. Frick et al.

10:50-13:10	Session 6: EPM assisted continuous casting Chairmen: Gunter Gerbeth		
10:50-11:20	22 Keynote	Development on the compound electromagnetic continuous casting processing for Ni-based corrosion resistant alloys	Engang Wang Fei Wang
11:20-11:40	23	How to electromagnetically stir in a slab continuous casting mold?	Zuosheng Lei Bin Li Haibiao Lu et al.
11:40-12:00	24	Control of melt pouring by adjustment of the volume electromagnetic force in the magnetohydrodynamic tundish at CSS	Oleksiy Smirnov S. Louhenkilpi A. Narivskiy et al.
12:00-12:20	25	Simulation of direct metal strip casting	Valters Dzelme A. Jakovičs

12:20-13:30 Lunch break

13:30	Session 7: Fundamentals of EPM, MHD, theory & modeling Chairmen: Sven Eckert, Andrejs Sabanskis		
13:30-14:00	26 Keynote	Twenty years' research on microwave application to metal production and recycling	Noboru Yoshikawa

14:00-14:20	27	Effect of oscillating force imposition on concentration boundary layer uniformity near solid-liquid interface	XU Guangye IWAI Kazuhiko
14:20-14:40	28	Small scale short circuits due to metal-droplet transfer in liquid metal batteries	S. Bénard S. Landgraf Norbert Weber T. Weier
14:40-15:00	29	Electro-vortex flow in a cuboid vessel: Induced electric current study	Karla P. Acosta-Zamora A. Beltrán
Break 20 min			
15:20-15:40	30	Influence of permanent magnet array configurations on near-wall MHD turbulence	Amandine Capogna O. Doche J. Schillings et al.
15:40-16:00	31	Effect of motion term of Lorentz force on flow instability	Ivan Smolyanov E. Shmakov E. Baake
16:00-16:20	32	Electrically driven Alfvén wave investigation	Samy Lalloz A. Potherat L. Davoust F. Debray
16:20-16:40	33	Rotating waves in magnetized spherical Couette flows	Jude Ogonna F. Garcia et al.

17.00-19.00 – poster session (11 posters)

5 min presentation for each poster

Chairman: Arturs Brēķis

1.	Department of Magnetic Hydrodynamics, Physico-Technological Institute of Metals and Alloys of the National Academy of Sciences of Ukraine, 34/1 Academician Vernadsky ave., Kyiv 03142, Ukraine	E. Seredenko V. Seredenko	Effect of a constant magnetic field on the redistribution of ferro-, para- and diamagnetic components during solidification of an alloy based on Al-Cu-REM between its phases	17:15-17:20
2.	Institute of Numerical Modelling, University of Latvia, 3 Jelgavas street, LV-1002, Riga, Latvia	Kirils Surovovs A. Kravtsov J. Virbulis	The role of numerical modelling in the diameter increase of silicon crystals grown from pedestal	17:20-17:25
3.	State Key Laboratory of Advanced Special Steel & Shanghai Key Laboratory of Advanced Ferrometallurgy, Shanghai University, Shanghai	Haibiao Lu Bin Li Yunbo Zhong et al.	Numerical simulation of EMS position on flow, solidification and inclusion transport in slab continuous casting	17:25-17:30

4.	Physico-Technological Institute of Metals and Alloys, National Academy of Sciences of Ukraine, 34/1 Vernadsky Boulevard, Kyiv, 03142, Ukraine	A. Narivskiy O. Smirnov M. Goryuk et al.	Improvement of aluminium alloys after their MHD-plasma processing in liquid state	17:30- 17:35
6.	Institute of Electrotechnology, Leibniz University Hannover, Wilhelm-Busch-Straße 4, 30171 Hannover, Germany	Mattia Guglielmi I. Smolyanov J. Vencels E. Baake	Investigation of an electromagnetic stirring process by parallel numerical simulations in ANSYS FLUENT and OPEN FOAM	17:40- 17:45
7.	LU Institute of Physics	Ervins Blumbergs J. Freibergs E. Platacis et al.	Study of the degree of cadmium reduction from cadmium oxide by the electroslag method under different conditions	17:45- 17:50
8.	Institute of Thermodynamics and Fluid Mechanics, Technische Universität Ilmenau, Germany	Philipp P. Vieweg Yu. Kolesnikov Ch. Karcher	Experimental study of a liquid metal film flow in a streamwise magnetic field	17:50- 17:55
9.	Institute of Thermodynamics and Fluid Mechanics, Technische Universität Ilmenau, P.O. Box 100565, D-9864 Ilmenau, Germany	H. Kalis Yurii Kolesnikov Ch. Karcher	Rotating free shear liquid metal flows excited by crossed electric and magnetic fields	17:55- 18:00
10.	¹ CENOS, Kapseļu iela 25A-1, Rīga LV-1046, Latvia ² EPM Riga, Akmeņu iela 47, Ogres, Ogres nov. LV-5001, Latvia	Mihails Ščepanskis, V. Geža, D. Berenis, and T. Beinerts	Specialized MHD Software for Rotating Permanent Magnet Stirring on Top of CENOS Platform	18:00- 18:05
11.	Univ. Grenoble Alpes, CNRS, Grenoble INP, SIMaP, GRENOBLE, FRANCE	Amandine Capogna O. Doche L. Davoust	Effect of a localized MHD body force on the near-wall turbulence	18:05- 18:10

Wednesday. June 16

9:00-10:30	Session 8: Measuring techniques in liquid metal flows and nondestructive control Chairman: Noboru Yoshikawa		
9:00-9:30	34 Keynote	Real time flow control during continuous casting with contactless inductive flow tomography	Ivan Glavinić F. Stefani S. Eckert T. Wondrak

9:30-9:50	35	Measurement challenges in contactless inductive flow tomography for Rayleigh-Bénard convection cells	Max Sieger R. Mitra F. Stefani S. Eckert T. Wondrak
9:50-10:10	36	Flow reconstruction in a Rayleigh-Bénard convection cell with an aspect ratio 0.5 by contactless inductive flow tomography	Rahul Mitra M. Sieger V. Galindo et al.
10:10-10:30	37	Inductive system for magnesium level detection in a titanium reduction reactor	Nico Krauter S. Eckert T. Gundrum et al.

10:50-13:30	Session 9: MHD flows, EM pumps, EM brakes, EM stirrers, power sources (Parallel A) Chairman: Thomas Wondrak, Ivars Krastins		
10:50-11:20	38 Keynote	Experimental cavitation investigation of the electromagnetic PbBi pump with rotating permanent magnets	Kalvis Kravalis F. Boix I. Bucenieks et al.
11:20-11:40	39	Investigation of a disk-type electromagnetic pump with permanent magnets	Arturs Brēķis A. Šiško I. Bucenieks
11:40-12:00	40	Comparison of numerical approaches and techniques to simulate MHD duct flows	Ivan Smolyanov E. Shmakov E. Baake
12:00-12:20	41	Numerical study of a centrifugal electromagnetic induction pump with zero flowrate	Linards Goldšteins
Break 20 min			
12:40-13:00	42	Single dipole permanent magnet induction pump for liquid metals	Matiss Kalvāns A. Bojarevičs T. Beinerts A. Gaile
13:00-13:20	43	Growth rate of azimuthal perturbation modes in an ideal annular linear induction pump	L. Goldšteins L. Buligins Y. Fautrelle

10:50-13:30	Session 10: Modelling of EPM and MHD problems (Parallel B) Chairman: Olga Budenkova, Laurent Davoust		
10:50-11:20	45 Keynote	Physical modeling based on simultaneous similitude of multiple dimensionless numbers. Precise	Yuichi Tsukaguchi K. Fujita

		representation of flow phenomena by T-cast experiment	
11:20-11:40	46	Numerical and experimental study of electrovortex flow and temperature field in liquid metal with bifilar power supply	A. Chudnovsky Yu. Ivochkin A. Jakovics Sergejs Pavlovs et al.
11:40-12:00	47	Analysis of travelling magnetic field stirrer operation modes at asymmetric power supply using the method of symmetric components	I. Sokolov G. Losev E. Shvydkiy
12:00-12:20	48	On MHD considerations and a revised deal-grove model to model the surface flow of oxidised molten aluminum alloy	K. Patouillet Laurent Davoust O. Doche
Break 20 minutes			
12:40-13:00	49	Model experiments for heater concepts in Czochralski crystal growth processes	Josef Pal A. Enders-Seidlitz K. Dadzis
13:00-13:20	50	3D numerical simulation with validation of travelling magnetic field stirring generated by a Bitter coil for silicon directional solidification process	Brahim Hiba Ab. Nouri L. Hachani K. Zaidat
13:20-13:40	51		

Lunch 13:40-14:40

14:40-16:30	Session 11: Advanced materials processing in static or alternating magnetic fields Chairman: Egbert Baake		
14:40-15:10	52 Keynote	Numerical modelling of redistributing non-metallic particles in a liquid metal using electro-pulsing	Daniel .E.A. van Odyck
15:10-15:30	53	Modeling of mass transfer and chemical processes at the metl-gas interface for liquid silicon refinement	Ģirts Zāģeris V. Geža
15:30-15:50	54	Feasibility of using contactless electromagnetic cavitation for steel composite manufacturing	Mārtiņš Sarma I. Grants T.Herrmannsdörfer G. Gerbeth
15:50-16:10	55	Experimental and simulation study on electromagnetic heating and stirring of V ₂ O ₅ -Na ₂ O molten glass	Noboru Yoshikawa K.Watanabe T.Igarashi S.Komarov
16:10-16:30	56	Increasing the efficiency of refining and modification of aluminium alloys using electromagnetic factors	V. Fikssen

16:30-17:00 Closing of the EPM2021 conference

Partners



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