



10th INTERNATIONAL CONFERENCE ON MAGNETISM AND METALLURGY

June 13th to 15th, 2022

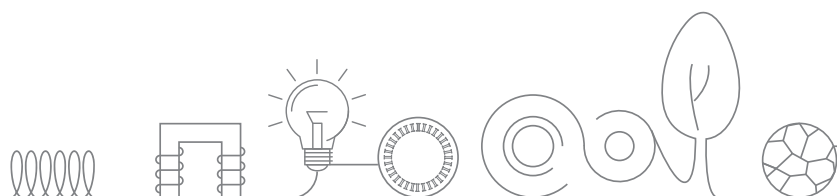
Politecnico Milano (POLIMI)
Milan, Italy



Main sponsor



In collaboration with





SCOPE OF THE CONFERENCE

Organised by RINA, the 10th International Conference Magnetism and Metallurgy WMM'22 will take place from June 13rd to 15th, 2022 in Milan, Italy.

The consolidated aim of this series of International Conferences on Magnetism and Metallurgy is to bring together scientists from universities and research groups working on the development of magnetic materials, experts from the Industrial companies producing magnetic materials as well as electrical engineers from universities and industry, who are engaged in applications of magnetic materials.

The series of International Conferences, Magnetism and Metallurgy was established in 2004 by the Institute of Metal Forming at the Technische Universität Bergakademie Freiberg. WMM conferences take place every two years. The conferences of 2004, 2006, 2010, took place in Freiberg. The editions of 2008 and 2012 took place in Ghent and the last four editions took place respectively in Cardiff, 2014, Rome, 2016, Dresden 2018, and Rome 2020 (on-line Conference).

Starting from 2020, RINA is in charge of the organization of WMM series of conferences. Chairman of the conference is Dr. Stefano Fortunati. Dr. Stefano Cicalè is the Program Manager. The WMM '22 conference, for the first time in collaboration with QUICKFairs®, will be an excellent forum for the exchange of ideas on the status and further trends between experts from the industry and research institutes. The main sponsor of WMM22 is EUROGROUP. The conference benefits from scientific cooperation of Università dell'Aquila and has the support of UK Magnetic Society and Associazione Italiana di Metallurgia.

The 10th International Conference WMM '22 in Milan, June 2022, will cover the latest developments, and participants will have the chance to discuss the progress in the field of Magnetism and Magnetic Materials and their Applications. The program will include invited lectures and posters. All the contributions will be published in a book of conference proceeding. All the participants will receive the book of proceedings at the conference site.



TOPICS OF THE WMM'22

- Progresses in Electrical Steels and other Soft Magnetic Materials grades
- Progresses in Fabrication of Electrical Steels and other Soft Magnetic Materials and the equipment for their manufacturing
- FeSi Steels, and other Soft Magnetic Materials: advances in the optimum microstructure development and control along processing route
- Modeling of Microstructure evolution along processing routes of Electrical Steels and other Soft Magnetic Materials
- Microstructure and Magnetic properties relations: advances in understanding and products design
- New coating and surface quality of Electrical Steels in relation to magnetic quality
- Renewable energy: magnetic materials and related technologies
- Advances in Magnetic measurements and characterizations of soft and hard Magnetic Materials
- Fabrication methods of magnetic cores of electric machines - status and further developments
- Performance of Electric Machines: Optimum magnetic materials and Optimum Design
- Electric Mobility applications - Tailoring Material Grades for the different Types of Vehicles





CONFERENCE CHAIRMAN

- Dr. Stefano Fortunati, RINA, Italy



PROGRAM MANAGER

- Dr. Stefano Cicalè, RINA, Italy.



PROGRAM COMMITTEE

- Prof. Jürgen Schneider
- Prof. Antony Moses
- Prof. Marco Villani, University of L'Aquila, Italy

Coordinated by the PROGRAM MANAGER, Dr. Stefano Cicalè



INTERNATIONAL ADVISORY COMMITTEE

- Giuseppe Carlo Abbruzzese, RINA, Italy
- Shenglin Chen, BaoWu Iron and Steel Co., China
- Erik Hilinski, Tempel Steel, USA
- Sigrid Jacobs, ArcelorMittal Global R&D, Belgium
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- Yoshiyuky Ushigami, Nippon Steel Corporation, Japan
- Niklas Volbers, VAC, Germany
- Markus Weber, ThyssenKrupp Electrical Steel, Germany
- Liu Xian Dong, BaoWu Iron and Steel Co., China
- Steve Sprague, Proto Lam, LLC, USA



WMM'22 IMPORTANT DATES

- Abstract Submission, Application Exhibition, Registration (early bird) **25.02.2022**
- Manuscripts Submission **21.03.2022**



SECRETARY'S OFFICE OF THE WMM'22

Dr. Elisabetta Amici, RINA
Via di Castel Romano, 100
00128, Rome, Italy
Tel: +39 3356682147
Email: WMMconference@rina.org

Dr. Cristina Forzanti, RINA
Viale Benedetto Brin 218, Terni
05100 Terni, Italy
Tel: +39 0744487306
Email: WMMconference@rina.org



CONFERENCE WEBSITE

All the information about WMM22 can be found in the conference website: www.rina.org/en/adv/wmm22





REGISTRATION FEES

The registration fee includes conference proceedings, refreshments, lunches, as well as a social program and the conference dinner.

Conference attendance:	750 EUR (+VAT, if due)
Exhibitors*:	2500 EUR (+VAT, if due)
Conference attendance for PHD students:	350 EUR (+VAT, if due)
Gala dinner for accompanying person:	100 EUR (+VAT, if due)
On-line Conference attendance**:	450 EUR (+VAT, if due)

For registration you are kindly asked to complete the registration form that can be found in the conference website. Once the registration is complete, the attendees will receive, a few days before the conference, the link to log into the conference digital platform.

*For conference & exhibition space.

**On-line Live connection to WMM22 Plenary Session (all three days) has been organized to allow participation of those who are still inhibited to travel due to Government restrictions.



POSTERS AND EXHIBITS

WMM'22 will include a limited number of exhibits and poster papers. Preference will be given to posters presenting R&D results on materials technologies and/or devices. Authors of posters can present a paper of up to 15 pages that strictly follows the template and guidelines provided in the conference website. The papers should be uploaded in the conference website and will be submitted to the program manager that will inform applicants on their acceptance.

POSTER SIZE DIMENSIONS: 0.7m (l) x 1m (h). Panels to attach the posters will be provided at the conference table 1.20m x 0.80m, two chairs, electric outlet. If there are different needs, possible supplement will be evaluated. Exhibitor roll-up or banner are well accepted

EXHIBIT SPACE:



PROGRAM

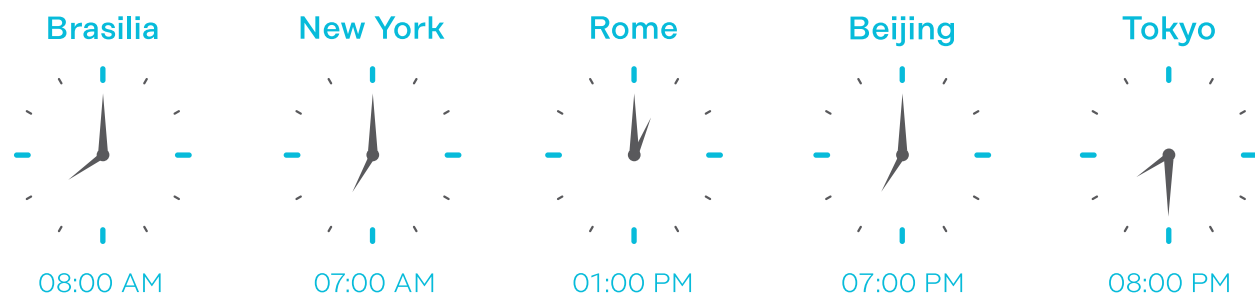
The WMM'22 is planned to start at 8:30 AM of June 13th, 2022 and to close at 5:30 PM of Wednesday, June 15th 2022. Secretary's office is open for registration from the afternoon of June 12nd, 2022 and throughout the entire conference from 8:00 AM to 3:00 PM.

On the first day, after the conference afternoon Sessions, it will be offered the opportunity to participate to a guided visit to plants and facilities of EUROGROUP Laminations in Baranzate (MI).



TIME ZONES

In order to allow registered users with different time zones to follow the entire conference, it will be possible to review the recorded video of the presented lectures of the invited speakers who have given their consent (deferred viewing), in a special protected digital area reserved only for WMM22 registered users.



CONFERENCE PROGRAM

12th June 2022

12,00 - 19,00 Secretary office is open for participants registration and exhibitors set up

13th June 2022

08,30 - 09,00 **Welcoming & opening remarks**
Stefano Fortunati, *Conference Chairman*
Donatella Sciuto, *Prorettrice Politecnico di Milano*

Session 1 Chairman: Stefano Cicalè

- 09,00 - 09,30 Topology optimization of Synchronous Reluctance motor for electric vehicles with different NGO electrical steels
Marco Villani, *University of L'Aquila*
- 09,30 - 10,00 Next generation ferromagnetic materials for reduced critical rare earth electrical traction machine topologies
Sigrid Jacobs, *Arcelor Mittal global R&D*
- 10,00 - 10,30 Influence of grain structure on the accuracy of computational electromagnetics in electrical machine core loss predictions
Anthony Moses, *Cardiff University*
- 10,30 - 11,00 Basic investigation of magnetic properties of hybrid stacks made from CoFe and SiFe
Niklas Volbers, *VACUUMSCHMELZE GmbH & Co*
- 11,00 - 11,30 Tooling effects on electrical steels: correlation between simulated and experimental results in inverter fed induction motors
Mircea Popescu, *Motor Design Limited, UK*

11,30 - 12,30 **Brunch**

Session 2 Chairman: Stefan Siebert

- 12,30 - 13,00 Higher strength NGO steels for application in motors
Bevis Hutchinson, *Swerim Kista*
- 13,00 - 13,30 Considerations for xEV Motor Core Production from a Lamination Stamper
Erik Hilinski, *Tempel Steel Company*
- 13,30 - 14,00 Effect of B(H) curve extrapolation at high saturation levels on calculation of no-load operating conditions of IPM motors
Antonino Di Gerlando, *Politecnico di Milano*
- 14,00 - 14,30 Evolution of Grain Size and Texture at Final Annealing of Ferritic Non-oriented FeSi Steels
Juergen Schneider, *Stahlzentrum Freiberg e.V.*
- 14,30 - 15,00 Comparative analysis between conventional fastenings, annealing and glue bonding effect on electric motor stator acoustic noise and core loss
Mario Villalon, *Eurotranciatutura Mexico*

1st day session closure

- 15,00 - 15,30 Meeting point for BUS
- 15,30 - 16,30 BUS transfer to Eurogroup Baranzate and to the Dome of Milan
- 16,30 - 19,30 **Welcome cocktail and visit to facilities and plants of EUROGROUP Laminations**
- 19,30 - 20,30 BUS transfer to Camparino in



14th June 2022

Session 3 Chairman: Bevis Hutchinson

- 08,30 - 09,00 Effect mechanism of trace Nb on characteristics of inclusion in grain-oriented silicon steel
Li Guangqiang, *Wuhan University of Science and Technology*
- 09,00 - 09,30 Improving magnetic properties of non-oriented electrical steels by annealing
Seil Lee, *Posco*
- 09,30 - 10,00 Use of metallurgical models to predict GOES magnetic properties and to design new production technologies
Giuseppe Carlo Abbruzzese, *Spires Srl*
- 10,00 - 10,30 *Coffee Break*
- 10,30 - 11,00 **Posters & Exhibitors session**

Session 4 Chairman: Gwynne Johnston

- 11,00 - 11,30 Electric motors and xEV NOES: future demand outlook for the automotive sector
Claudio Vittori, *S&P Global Mobility*
- 11,30 - 12,00 The $\{311\}_{136}$ Recrystallization Texture Component of Non-Oriented Electrical Steels
Leo Kestens, *University of Gent*
- 12,00 - 12,30 On the Grain Size distribution in decarburized strips of HGO ES grades. Large scale heterogeneity
Stefano Fortunati, *Rina*
- 12,30 - 13,30 *Lunch*

Session 5 Chairman: Sigrid Jacobs

- 13,30 - 14,00 It is more than metallurgy - a look to the future of High-Frequency NGO production
Mike Grimmet & Kate Wasem, *Big River Steel*
- 14,00 - 14,30 Powerful plant technologies for cold rolling on NGO and GO electrical steels
Konrad Krimpelstaetter, *Primetals*
- 14,30 - 15,00 Recent trends in the production of Nd-Fe-B permanent magnets
David Brown, *University of Birmingham*
- 15,00 - 15,30 *Coffee Break*
- 15,30 - 16,00 **Posters & Exhibitors session**

Session 6 Chairman: Giuseppe Carlo Abbruzzese

- 16,00 - 16,30 Recrystallization model for final annealing of non-grain oriented electrical steel
Christian Wuppermann, *LOI Thermprocess GmbH*
- 16,30 - 17,00 Si-Cr-Al-Mn Alloys for high specific resistivity and application to Grain Oriented and Non-Grain-Oriented electrical steels
Garrett Angus, *Cleveland-Cliffs*
- 17,00 - 17,30 Comprehensive study of heating and drying rates after the GO and NGO electrical steel coating
Nicolas Even, *Solaronics*

2nd day session closure

- 17,30 - 18,00 Meeting point for BUS
- 18,00 - 19,00 BUS transfer to Museo della Scienza e della Tecnica Leonardo da Vinci
- 19,00 - 23,00 *Leasure visit and Gala dinner at Museo della Scienza e della Tecnica Leonardo da Vinci*

During the evening event Dr. Alexander Krick, Senior Director Technical Development E-Drives, Power Electronics and Transmissions - Volkswagen Group Components, will give a speech on the "Electrification Strategy of Volkswagen Group"

- 23,00 - 23,30 BUS transfer to POLIMI



15th June 2022

Session 7 Chairman: Eric Hilinski

- 08,30 - 09,00 Recent development of grain-oriented electrical steel sheets and their texture control
Kenichi Murakami, *Nippon Steel & Sumitomo Metal*
- 09,00 - 09,30 Influence of Oxidizing and Nitriding Parameters on Nitrogen Concentration of Fe-3%Si Electrical Steels
Mihaela Teodorescu, *ThyssenKrupp Electrical Steel*
- 09,30 - 10,00 Continuous monitoring of local variations in magnetic properties across the material width and length of electrical steel coils
Stefan Siebert, *Brockhaus Measurements*
- 10,00 - 10,30 New developments in soft magnetic materials alternative to Fe-Si alloys and their magnetic characterization techniques
Luca Ferraris, *Politecnico di Torino*
- 10,30 - 11,00 *Coffee Break*
- 11,00 - 11,30 **Posters & Exhibitors session**

Session 8 Chairman: Luca Ferraris

- 11,30 - 12,00 Efficiency or affordability in EV? Thickness matters
Gwynne Johnston, *Metals Technology Consulting Inc*
- 12,00 - 12,30 An integrated and holistic approach for measurement and validation of electric machine
Govind Bisht, *Laboratorio Elettrofisico*
- 12,30 - 13,00 Benefits of laser scribing process on the magnetic power loss of grain-oriented electrical steel
Simone Peli, *Castellini Solutions*
- 13,00 - 13,30 Finite element modelling of the magnetic property behaviours of electrical steels in complex electromagnetic fields considering their crystallographic textures
Jun Liu, *University of Cardiff*
- 13,30 - 14,30 *Lunch*

Session 9 Chairwoman: Cristina Forzanti

- 14,30 - 17,30 **Oral Session for Poster Authors**
- 3rd day session closure**





POSTER SESSION

NAME	AFFILIATION	TITLE
Carolina Cesconetto Silveira	Aperam	High permeability grain-oriented electrical steel produced by reversible hot rolling mill
Christoph Dobler	University of Linz	Novel Concept for Identification and Correction of Asymmetric Hystereses when Characterising SMM
Nikolas Mavrikakis	ArcelorMittal	Influence of Si content and microstructure on magnetic ageing in non-oriented electrical steels
Schneider Juergen	Formerly from Freiberg University Stahlzentrum Freiberg e.V.	Warm Rolling of Ferritic Nonoriented FeSi Steels
Schneider Gerhard	Aalen University	Additive manufacturing of soft magnetic materials and components
Shirin Nouhi	Swerim	In-situ study of electrical steels phase transformation in the presence of oxygen
Tuomo Nyssonen	Swerim	Experimental approaches for characterising microstructures and textures of non-grain-oriented (NGO) steels
Zaizen Yoshiaki	JFE	Analysis of IPM motor using newly-developed Si-gradient steel (JNRF)
Hsin-Yi Lee	China Steel Corporation	Complex Effects on Magnetic and Mechanical Properties of Non-oriented Electrical Steel by Cu Precipitates
Andreas Schoppa, Florian Winkler	Teprosa	Laser cutting of laminations and assembling of magnetic cores using NGO electrical steel with adhesive coating - technological challenges and possibility of optimization
Daniel Wöckinger	Johannes Kepler Universität Linz	Evaluation of a Novel Measuring Concept for Estimating the Composition of Materials in Industry
Eric Theisen	Metglas	Recent Advances in Amorphous Foils Including Magnetic Domain Refining for Core Loss Reduction
Zhaoyang Cheng	The State Key Laboratory of Refractories and Metallurgy, Wuhan University of Science and Technology	Effect of warm rolling temperature on microstructure and texture evolution of 6.5 wt.% Si non-oriented electrical steel during recrystallization
Anett Stöcker, Ulrich Prah, Rudolf Kawalla	Bergakademie Freiberg	Impact of hot rolling conditions on microstructure, texture, and magnetic properties of ferritic Fe-2.4wt.% Si non-oriented electrical steel





LIST OF EXHIBITORS

Brockhaus	www.brockhaus.com
Castellini Solutions	www.castellini.it
EUROGROUP	www.eurogroup.com
Laboratorio Elettrofisico	www.laboratorio.elettrofisico.com
LCD LaserCut AG	www.lcd-lasercut.ch
LTC Group	www.ltc-group.com
Metglas	www.metglas.com
RINA	www.rina.org
TEPROSA	www.teprosa.de
University of L'Aquila & R13 Technology	www.univaq.it



PROCEEDINGS

The WMM'22 proceedings book including all the papers from invited speakers and posters will be printed in full color and distributed at the conference.



VISA APPLICATION

All regularly registered conference attendees who need an invitation letter for the VISA application can send their request to the **WMM22 SECRETARY'S OFFICE** mail address:

WMMconference@rina.org





CONFERENCE VENUE

The 10th International Conference Magnetism and Metallurgy WMM'22 will take place in Milan at:

Politecnico Milano (POLIMI)

via Ampere, 2
20133 Milan, Italy

Conference Room E.N.Rogers
Building 11, ground floor

COVID prescription connected to the site of the conference



WMM22 Conference AREA

WMM22 conference will have at its disposal a very large and well-connected area:
E.N.Rogers Conference Room devoted to the conference sessions
Foyer to host the Exhibitors & POSTER sessions



HOW TO REACH

Milan Malpensa Airport - Politecnico Milano (POLIMI)
55 km / 60 min by car and by train

Milan Linate Airport - Politecnico Milano (POLIMI)
7 km / 30 min by car and by train

Milano Centrale train station - Politecnico Milano (POLIMI)
3 km / 30 min by car and by train and 30 minutes walking



SOCIAL EVENTS FOR ALL DELEGATES

First Day

Welcome cocktail and visit to facilities and plants of EUROGROUP Laminations, at Baranzate (MI)

Second Day

In the late afternoon guided tour of Museo Nazionale Scienza e Tecnologia Leonardo Da Vinci, Milan
Gala dinner - Sala Polene, inside the museum





HOTELS NEAR THE CONFERENCE VENUE

HOTEL	Walking distance (minutes)	Metro Station	Medium price (euro)
Best Western Plus Hotel Galles	17	Loreto 8 min	134
iQ Hotel Milano	30	Centrale - 10 min	160
Spice Hotel Milano	25	Centrale - 10 min	100
Doria Grand Hotel Milano	18	Loreto - 10 min	100
Andreola Center Hotel Milano	22	Caiazzo - 10 min	80
Unahotels Century Milano	30	Centrale - 12 min	120
Mini Hotel Aosta	26	Centrale - 12 min	80



LINK

<https://www.galles.it/>

https://www.iqhotelmilano.it/it/?utm_source=GMBlisting&utm_medium=organic

<https://www.spicehotelmilano.it/>

<https://www.doriagrandhotel.it/>

<https://www.andreolahotel.it/>

<https://www.gruppouna.it/unahotels/unahotels-century-milano>

<https://www.minihotel.it/it/hotels/aosta/home.html>



