CALL FOR ABSTRACTS

The International Conference on Metallurgical Coatings and Thin Films (ICMCTF) is recognized as the premier international conference on thin film deposition, characterization, and advanced surface engineering. It provides a forum and networking venue for scientists, engineers, and technologists from academia, government laboratories, and industry. Attendees from all over the world come to present their findings, exchange ideas, share insights, make new friends, renew old acquaintances, and establish collaborations. ICMCTF typically draws more than 700 attendees, covering some 35 oral technical sessions and a well-attended Thursday evening poster session.

ICMCTF 2024 will have seven technical symposia covering synthesis processes, materials (four symposia), advanced characterization, modeling, and industrial applications, and five topical sessions that pertain to materials, processes, and applications for sustainable development. The latter is further emphasized as Surface Engineering for Sustainable Development is an overarching theme of ICMCTF 2024. The conference will open on Monday morning by Professor Yury Gogotsi from Drexel University, Philadelphia, US, with a plenary lecture entitled "Engineering 2D MXene Surfaces for Functional Films and Coatings". Another special highlight of the meeting is our Exhibition Keynote Lecture, entitled "Materials Innovations and Challenges of Thin Films and Plasma Applications for 3 nm Node and Beyond" presented by Dr. Samuel Chiu, Senior Technical Director, Applied Materials, Taiwan. There will also be two Keynote lectures, highlighting the importance of materials for sustainable industrial applications.

In addition to the technical program, the conference features a two-day industrial exhibition showcasing the latest equipment, materials, and services used for the deposition, monitoring, and characterization of coatings and thin films. The exhibition, which will be held Tuesday and Wednesday, May 21-22, will be open to the public, as well as a Career Center where organizations may post jobs, and candidates may interview for positions throughout the week. An educational program of Short Courses will be offered throughout the week.

Each year, the R.F. Bunshah and Bill Sproul Award Laureates and three outstanding Graduate Student Award winners are celebrated during a special convocation ceremony late Wednesday afternoon, May 22, followed by a festive reception in the evening. In addition, we hope to see many of the major leaders of the conference to mark the 50th anniversary.

ICMCTF will again publish excellent scientific and technical work in a peer-reviewed issue of the Elsevier journal *Surface and Coatings Technology (IF = 5.2)*, so we strongly encourage all authors to submit manuscripts for consideration by July 15, 2024. The papers will be open access for 12 months after publication.

The Town and Country Resort Hotel and Convention Center, located in sunny San Diego of Southern California, will be the official conference venue, providing a relaxing atmosphere for discussion and networking among attendees.

We welcome your participation and look forward to receiving your abstract by submission deadline, November 15, 2023!

Johanna Rosen
2024 Program Chair

Jyh-Wei (Jeff) Lee
2024 General Chair

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SYMPOSIUM PP: PLASMA AND VAPOR DEPOSITION PROCESSES
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Symposium Chair: Farwah Nahif, farwahnahif@icloud.com
Symposium Chair: Jyh-Ming Ting, National Cheng Kung University, Taiwan , jting@mail.ncku.edu.tw

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PP4: Deposition Technologies for Carbon-based Coatings
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PP5: Plasma Surface Interactions and Diagnostics
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PP6: Microfabrication Techniques with Lasers and Plasmas
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Valentina Dinca, National Institute for Laser, Plasma, and Radiation Physics, Romania, valentina.dinca@inflpr.ro

PP7: Modeling and Data-Driven Methods for Process Design, Analysis and Control
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SYMPOSIUM MA (Materials A): PROTECTIVE AND HIGH-TEMPERATURE COATINGS
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Symposium Chair: Vladislav Kolarik, Fraunhofer Institute for Chemical Technology ICT, Germany, vladislav.kolarik@ict.fraunhofer.de
Symposium Chair: Francisco Javier Pérez-Trujillo, Universidad Complutense de Madrid, Spain, fjperez@ucm.es
Symposium Chair: Helmut Riedl, TU Wien, Institute of Materials Science and Technology, Austria, helmut.riedl@tuwien.ac.at
Symposium Chair: Wan-Yu Wu, National United University, Taiwan, wywu@nuu.edu.tw

MA1: Coatings to Resist High-temperature Oxidation, Corrosion, and Fouling
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Justyna Kulczyk-Malecka, Manchester Metropolitan University, UK, J.Kulczyk-Malecka@mmu.ac.uk
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MA2: Thermal and Environmental Barrier Coatings
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MA3: Hard and Nanostructured Coatings
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MA4: High Entropy and Other Multi-principal-element Materials
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Jean-Francois Pierson, Institut Jean Lamour - Université de Lorraine, France, jean-francois.pierson@univ-lorraine.fr

MA5: Boron-containing Coatings
Martin Dahlqvist, Linköping University, Sweden, martin.dahlqvist@liu.se
Anna Hirle, TU Wien, Austria, anna.hirle@tuwien.ac.at

SYMPOSIUM MB (Materials B): FUNCTIONAL THIN FILMS AND SURFACES

Symposium Chair: Peter Kelly, Manchester Metropolitan University, UK, peter.kelly@mmu.ac.uk
Symposium Chair: Jörg Patscheider, Evatec AG, Switzerland, joerg.patscheider@evatecnet.com

MB1: Thin Films and Surfaces for Optical Applications
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Juan Antonio Zapien, City University of Hong Kong, apjazs@cityu.edu.hk

MB2: Thin Films for Electronic Devices
Claudiu Falub, Evatec AG, Switzerland, claudiu.falub@evatecnet.com
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MB3: Nanomaterial-based Thin Films and Structures
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MB4: 2D Materials: Synthesis, Characterization, and Applications
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SYMPOSIUM MC (Materials C): TRIBOLOGY AND MECHANICS OF COATINGS AND SURFACES

Symposium Chair: Carsten Gachot, Vienna University of Technology, Austria, carsten.gachot@tuwien.ac.at
Symposium Chair: Giovanni Ramirez, Zeiss Industrial Metrology, USA, Giovanni.Ramirez@outlook.com

MC1: Friction, Wear, Lubrication Effects, and Modeling
Michael Chandross, Sandia National Labs, USA, mechand@sandia.gov
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Noora Manninen, Oerlikon Balzers, Oerlikon Surface Solutions AG, Liechtenstein, Noora.Manninen@oerlikon.com
Manel Rodriguez Ripoll, AC2T Research GmbH, Austria, ripoll@ac2t.at

MC2: Mechanical Properties and Adhesion
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Alice Lassnig, Austrian Academy of Sciences, Austria, alice.lassnig@oeaw.ac.at
Bo-Shiuan Li, National Sun-Yat Sen University, Taiwan , bsli@mail.nsysu.edu.tw

MC3: Tribology of Coatings and Surfaces for Industrial Applications
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Rainer Cremer, KCS Europe GmbH, Germany, cremer@kcs-europe.de
Stephan Tremmel, University of Bayreuth, Germany, stephan.tremmel@uni-bayreuth.de

SYMPOSIUM MD (Materials D): COATINGS FOR BIOMEDICAL AND HEALTHCARE APPLICATIONS

Symposium Chair: Jessica Amber Jennings, University of Memphis, USA, jjnnings@memphis.edu
Symposium Chair: Kerstin Thorwarth, Empa, Swiss Federal Laboratories for Materials Science and Technology, Switzerland, kerstin.thorwarth@empa.ch

MD1: Surface Coatings and Surface Modifications in Biological Environments
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Phaedra Silva-Bermudez, Instituto Nacional de Rehabilitación Luis Guillermo Ibarra Ibarra, Mexico, phaedrasilva@yahoo.com

MD2: Medical Devices: Bio-Tribo-Corrosion, Diagnostics, 3D Printing
Steve Bull, Newcastle University, UK, steve.bull@ncl.ac.uk
Hamdy Ibrahim, University of Tennessee at Chattanooga, USA, Hamdy-Ibrahim@utc.edu

MD3: Bioactive Surfaces
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Sandra E. Rodil, Universidad Nacional Autónoma de México, srodil@unam.mx

SYMPOSIUM CM: ADVANCED CHARACTERIZATION, MODELLING AND DATA SCIENCE FOR COATINGS AND THIN FILMS

Symposium Chair: David Holec, Montanuniversität Leoben, Austria, david.holec@unileoben.ac.at
Symposium Chair: Xavier Maeder, Empa, Swiss Federal Laboratories for Materials Science and Technology, Switzerland, xavier.maeder@empa.ch
Symposium Chair: Olivier Pierron, Georgia Institute of Technology, USA, olivier.pierron@me.gatech.edu
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CM1: Spatially-resolved and In-Situ Characterization of Thin Films and Engineered Surfaces
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CM2: Advanced Mechanical Testing of Surfaces, Thin Films, Coatings and Small Volumes
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Matteo Ghidelli, LSRM CNRS, France, m.ghidelli@mpie.de
James Gibson, RWTH Aachen University, Germany, gibson@imm.rwth-aachen.de

CM3: Accelerated Thin Film Development: High-throughput Synthesis, Automated Characterization, and Data Analysis
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Helge Stein, TU Munich, Germany, helge.stein@tum.de

CM4: Simulations, Machine Learning and Data Science for Materials Design and Discovery
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Ferenc Tasnadi, Linköping University, Sweden, tasnadi@ifm.liu.se

SYMPOSIUM IA: SURFACE ENGINEERING - APPLIED RESEARCH AND INDUSTRIAL APPLICATIONS

Symposium Chair: Satish Dixit, Plasma Technology Inc., USA, s.dixit@ptise.com
Symposium Chair: Christoph Schiffers, CemeCon AG, Germany, christoph.schiffers@cemecon.de
Symposium Chair: Ta-Chin Wei, Chung Yuan Christian University, Taiwan , tcwei@cycu.edu.tw
Symposium Chair: Kumar Yalamanchili, Oerlikon Balzers, Oerlikon Surface Solutions AG, Liechtenstein, kumar.yalamanchili@oerlikon.com

IA1: Advances in Application Driven Research and Hybrid Systems, Processes and Coatings
Hana Baránková, Uppsala University, Sweden, Hana.Barankova@angstrom.uu.se
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Kumar Yalamanchili, Oerlikon Balzers, Oerlikon Surface Solutions AG, Liechtenstein, kumar.yalamanchili@oerlikon.com

IA2: Surface Modification of Components in Automotive, Aerospace and Manufacturing Applications
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Satish Dixit, Plasma Technology Inc., USA, s.dixit@ptise.com
SangYul Lee, Korea Aerospace University, Republic of Korea, sylee@kau.ac.kr
Masaki Okude, Mitsubishi Materials Corporation, Japan, okude@mmc.co.jp

IA3: Innovative Surface Engineering for Advanced Cutting and Forming Applications
Markus Esselbach, Oerlikon Balzers, Liechtenstein, markus.esselbach@oerlikon.com
Symposium Chair: Christoph Schiffers, CemeCon AG, Germany, christoph.schiffers@cemecon.de

SYMPOSIUM TS: TOPICAL SYMPOSIUM ON SUSTAINABLE SURFACE ENGINEERING

Symposium Chair: Nazlim Bagcivan, Nazlim Bagcivan, Schaeffler Technologies AG & Co. KG, Germany, nazlim.bagcivan@schaeffler.com
Symposium Chair: Marcus Hans, RWTH Aachen University, Germany, hans@mch.rwth-aachen.de

TS1: Coatings for Batteries and Hydrogen Applications
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Chen-Hao Wang, National Taiwan University of Science and Technology, Taiwan, chwang@mail.ntust.edu.tw

TS2: Sustainable Processing and Materials Selection for Surface Solutions
Fan-Bean Wu, National United University, Taiwan, fbwu@nuu.edu.tw
Jörg Vetter, J.Vetter-S3-consulting, Germany, inno.sus@gmail.com

TS3: Solar Thermal Conversion
Atasi Dan, National Institute of Standards and Technology (NIST), USA, atasi.dan@nist.gov
Telmo Echániz, University of the Basque Country, Spain, elmo.echaniz@ehu.eus

TS4: Coatings and Surfaces for Thermoelectrical Energy Conversion and (Photo)electrocatalysis
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Carlos Jose Tavares, University of Minho, Portugal, ctavares@fisica.uminho.pt

TS5: Circular Strategies for Surface Engineering
Marcus Hans, RWTH Aachen University, Germany, hans@mch.rwth-aachen.de
Nina Schalk, Montanuniversität Leoben, Austria, nina.schalk@unileoben.ac.at

Symposium PP: Plasma and Vapor Deposition Processes

Symposium PP focuses on plasma vapor deposition technologies, which are central to thin film synthesis and surface engineering. The symposia covers development and enhancement of established technologies, novel concepts, as well as advances in diagnostics and fundamental understanding of deposition processes.

PP1. PVD Coating Technologies

This session solicits contributions related to the development of new PVD methods and advancement of industrially applied technologies. Sputtering, cathodic arc, anodic arc, laser, and electron beam-based methods and their combinations are considered in particular. The session welcomes contributions incorporating topics such as in-situ measurements, plasma transport in electromagnetic fields, and computer-aided process development. Potential application areas include deposition technologies in use for wear-protective coatings for components and tools, low-friction thin films, high-temperature wear-, erosion-, and corrosion-resistant coatings, optical layers, biomaterials, decorative coatings, and materials for energy applications.

PP1 Invited Speakers:

Jianliang Lin, Southwest Research Institute, USA, "Plasma Enhanced Magnetron Sputtering and Its Applications in Industry"

PP2. HiPIMS, Pulsed Plasmas and Energetic Deposition

The energy carried to the thin film during deposition is crucial in reducing the growth temperature and improving the properties of thin film materials. Higher plasma density leads to enhanced ionization of the film precursors and offers better deposition process control. This results in improved coating characteristics, valuable for e.g., optical, wear-resistant, or photovoltaic applications. This session solicits contributions from academia as well as industry and covers both the physics and the applications of energetic deposition. Topics of interest include but are not limited to plasma generation and discharge physics, model-driven process understanding, reactive processes and process control, mechanisms of film growth, surface and interface engineering, industrial applications and production, upscaling and associated equipment.

PP2 Invited Speakers:

Tomas Kubart, Uppsala University, Sweden, "Strategies for Low Temperature Reactive Deposition of Crystalline TiO_2 Thin Films"

Sebastian Siol, EMPA - Swiss Federal Laboratories for Materials Science and Technology, Switzerland, "Metal-Ion Synchronized HiPIMS of AlN and AlScN for Piezoelectric Applications"

PP3. CVD Coating Technologies

This session solicits experts in thin films deposition techniques, involving chemical vapor deposition, for the growth of protective coatings and multifunctional, smart, or hard materials. This session will address (1) various techniques including Atmospheric Pressure CVD, LPCVD, MOCVD, ALD, HVPE, Pulsed CVD, and their plasma-assisted counterparts, PECVD and PEALD; (2) novel molecular CVD precursors or original delivery systems for low vapor pressure/difficult precursors (DLI, pressure pulse, direct halogenation) ; (3) properties of materials and structures grown by these deposition techniques; and (4) CVD modeling techniques from molecular to equipment scale.

PP3 Invited Speakers:

PP4. Deposition Technologies for Carbon-based Coatings

This session solicits contributions that address the application of carbon-based coatings industry. We want to span the whole range from applications for DLC or ta-C on engineering components as well as coatings employed in devices and displays or electrochemical applications like fuel cells and electrolytic applications. Deposition technologies include plasma-based methods CVD, PVD, and their combination, arc, ion-beam, and laser-assisted deposition and HIPIMS as well as dip coating, sol-gel, and other transfer techniques. This session includes fundamentals and development of interfaces between substrate and DLC to improve adhesion, supporting layers, and hybrids with hard coatings, industrial practices, scalability, and cost estimates.

PP4 Invited Speakers:

Jens Emmerlich, Robert Bosch Manufacturing Solutions GmbH, Germany, "DLC-Coating Against the Backdrop of High Economic Requirements"

Kwang-Ryeol Lee, Korea Institute of Science and Technology, Republic of Korea, “Molecular Dynamics Study on the Interfacial Phenomena of Diamond-like Carbon Thin Film”

PP5. Plasma Surface Interactions and Diagnostics

Plasma processes are at the heart of inventive deposition strategies for innovative coating materials, nanostructures with enhanced properties and surface functionalization to improve surface adhesion properties of the materials. Plasma is widely used from vacuum to atmospheric pressures in the production of semiconductors, material treatment, plasma processing, reforming processes, plasma medicine, agriculture, catalysis and aerospace engineering. Diagnostics based on plasma composition and in surface characterization are essential to understand the physical properties of the coatings and mechanisms of the plasma growth processes and plasma-surface interaction. The objective of this session is to show how such correlations could establish processing-structure-property relationships and improve the design of materials. This session is focused on talks featuring new plasma diagnostic techniques, characterization of plasmas in novel processes, plasma treatment surface characterization, correlation of intrinsic plasma properties to the structure and composition of materials and deployment of modeling and artificial intelligence/machine learning/big data methods to reveal the mechanisms of plasma generation, film growth, plasma surface modification and process quality assurance.

PP5 Invited Speakers:

Scott Walton, Naval Research Laboratory, USA, "The Role of Plasma in Plasma Enhanced Atomic Layer Deposition"

PP6. Microfabrication Techniques with Lasers and Plasmas

Laser and plasma sources provide tunable fluxes of photons, electrons, ions, and radicals available for microscale-controlled film deposition, surface etching/texturing, and functionalization. The scope of this session encompasses laser/plasma processes aimed at chemical modification for catalytic substrates and surface engineering to fabricate biomaterials and microelectronic devices. Here, strategies to synthesize nanostructured interfaces enabling few-atom catalysts, organic tissues, and electronic heterostructures, like laser microtexturing and plasma-enhanced atomic layer deposition, will be discussed. This session thereby welcomes contributions on laser and plasma techniques to generate functional interfaces in the domains of atoms, polymer chains, cells, microchips, and entire tissues, with experimental and modeling approaches.

PP6 Invited Speakers:

Dirk Hegemann, EMPA, Switzerland, "Plasma Polymerization Processes"

Douglas B. Chrisey, Tulane University, “Laser Direct Write as a Testing Platform for CAD/CAM Autologous Organoids”

PP 7. Modeling and Data-Driven Methods for Process Design, Analysis and Control

This session will focus on digital methods to understand and control thin film deposition processes, encompassing topics such as simulations, small and large-scale data analysis, in-situ process feedback control, and real-time optimization. Additionally, we specifically encourage contributions on novel approaches, such as applying machine learning to any of the aforementioned methods. Models ranging from particle-in-cell (PIC) to fluid dynamics play a vital role in predicting film and coating properties and optimizing manufacturing processes. Furthermore, the utilization of advanced data-processing techniques, based on traditional algorithms or machine learning, can enhance the interpretation and utilization of simulation results, as well as process logs and metrology data. The session scope also includes related data infrastructure, which ties together all these aspects in information systems for tracking data in R&D and production facilities. We highly encourage abstracts that address topics such as process optimization, scale-up challenges, quality control, and the integration of digital tools into existing production workflows. Join us to explore the frontiers of simulation techniques, data-processing methods, and digitalization strategies, as we collectively propel the field of thin films towards enhanced performance, efficiency, and innovation.

PP7 Invited Speakers:

Ton Hurkmans, IHI Ionbond Netherlands B.V., Netherlands, “Digitalization Finds Its Way Into PVD Coating Facilities”

Jan Trieschmann, Kiel University, Germany, ”Insights on Plasma Processing from Multi-Scale Physical and Data-Driven Modeling”

PP8: Plasma and Vapor Deposition Processes (Symposium PP) Poster Session

Symposium MA (Materials A): Protective and High-temperature Coatings

Symposium MA focuses on surface engineering and materials science of protective and high-temperature coatings. The interaction of coating materials with harsh environmental conditions is addressed, including high-temperatures, thermochemical environments as well as mechanical loads. The environmental impacts include phenomena such as thermomechanical wear (e.g., abrasion, erosion, or mechanical stress), high-temperature aging, corrosion (e.g., oxidation, sulfidation, carburization, and water-accelerated degradation), or catalytic and physical fouling (e.g.,

coking, ash fouling, and slagging). The symposium addresses as well coating deposition processes, architectural designs, and process-structure-property relationships of protective coatings. The protective coating materials range from metallic alloys to ceramics such as nitrides, borides, oxides, or carbides. Furthermore, specific alloying strategies such as high entropy alloys (HEAs) and other multi-principal-element materials obtaining unique chemical and physical properties are of interest. The application areas span the energy generation, the aviation sector as well as machining industry highlighting new developments towards zero GHG emission and sustainability.

MA1. Coatings to Resist High-temperature Oxidation, Corrosion, and Fouling

This session spans all aspects of design, processing, and performance of coatings to resist high-temperature oxidation, corrosion, and fouling. Topics include composition and process optimization, characterization of coatings and reaction products, development of advanced processing methods such as additive manufacturing, modeling of fabrication processes and degradation mechanisms, lifetime prediction and performance assessment in realistic conditions (atmosphere, stress, cycling, erosion, etc.). Environments of interest include, steam, SCO2, molten salts, liquid metal, hydrogen, ammonia, biofuels, etc. for applications such as turbomachinery, fuel cell and electrolyzers for green hydrogen production, concentrating solar power plants, advanced nuclear reactors, petrochemical and gasification plants, waste incinerators and metal-forming and recycling industries. Contributions addressing research as well as solutions are encouraged, with focus on coatings and surface modification.

MA1 Invited Speakers:

Fernando Pedraza, Laboratoire d'Etudes des Materiaux en Milieux Aggressifs, Université de La Rochelle, France, "Tunable Aluminide Coatings for Surface Finish and Improved Oxidation and Hot Corrosion Behaviour of Additive Manufactured Ni-Based Superalloys"

MA2. Thermal and Environmental Barrier Coatings

This session focuses on the design, development, synthesis, and applications of thermal and environmental barrier coatings for gas and high volume H2 turbines and other high and ultra- high temperature applications. Topics include process understanding and novel processing methods, characterization of coating microstructure, properties (thermal, optical, mechanical, and chemical), testing methods (destructive and nondestructive), structure-property relationships, residual stresses, aging phenomena, substrate/coating system effects, and failure mechanisms, including CMAS attack, erosion, abrasion, and impact. These topics can be addressed for experimental research and/or modeling development.

MA2 Invited Speakers:

Kuiying Chen, National Research Council, Canada, "Oxygen Permeability, Failure Analysis and Life Prediction of Environmental Barrier Coatings Under Adverse Environments"

MA3. Hard and Nanostructured Coatings

This session welcomes contributions related to the characterization, simulation, development, and application of hard coatings and surfaces, including the relationships among composition, microstructure, chemical and mechanical properties, and the influence of deposition conditions on those parameters. The session also covers multifunctional nanostructured coatings, including nanocomposite, multi-component, and layered films with designs adapting the microstructure down to the nanoscale level. The session emphasizes the design, synthesis, and characterization of novel coating concepts, their modeling, and applications, as well as the development and use of novel characterization techniques, bridging both theoretical and practical aspects of hard and smart coatings.

MA3 Invited Speakers:

Denis Kurapov, Oerlikon Surface Solutions AG, USA

Lina Rogström, Linköping University, Sweden

MA4. High Entropy and Other Multi-principal-element Materials

High entropy alloys (HEAs) and other multi-principal-element materials are multi-component systems in which high entropy of mixing, or kinetic effects, stabilize a solid solution. They exhibit unique chemical and physical properties and have therefore recently attracted a growing interest in the materials science community. This session will be a platform for thin film-related research on high entropy and multi-principal-element materials including metal alloys, carbides, nitrides, and oxides as well as other multi-component systems in which high entropy affects phase stability. Topics of interest include but are not limited to, modeling, thin film processing, and characterizations of HEAs and other multi-principal-element materials.

MA4 Invited Speakers:

Thomas Seyller, Chemnitz University of Technology, Germany, "Growth and Properties of Epitaxial High-Entropy Alloy Thin Films"

MA5. Boron-containing Coatings

Borides and boron-containing thin film materials are emerging as the next generation of hard, wear-, oxidation-, and corrosion-resistant coatings. Furthermore, various boron-based materials exhibit unique properties obtaining high potential for functional and architectural designs. The aim of this session is to provide a platform for first-principles design, synthesis, characterization of properties and defect structure as well as applications of different types of boron-containing protective and functional thin films.

MA5 Invited Speakers:

Jakoah Brgoch, University of Houston, USA

MA6: Protective and High-temperature Coatings (Symposium MA) Poster Session

Symposium MB (Materials B): Functional Thin Films and Surfaces

This Symposium focuses on surfaces, coatings, and free-standing architectures with specific functionalities. The content encompasses materials growth and structure; fundamentals of operation; design of novel materials; production, processing, and integration into products and devices; and characterization of advanced functionality and sustainable development for a range of applications divided into the following sessions:

MB1. Optical Materials and Thin Films

Current applications of optical materials, thin films, and advanced structured materials impose extreme demands on their synthesis and performance. The optimization of these devices, from design to applications, can be facilitated by optical characterization methods such as spectrophotometry, ellipsometry, scatterometry, interferometry, vibrational spectroscopies, near-field microscopies and other light-matter interactions. We welcome contributions in the design, synthesis, characterization, and applications of thin films and nanostructures for optical applications.

MB1 Films Invited Speakers:

MB2. Thin Films for Electronic Devices

This session explores advancements in functional thin films for electronic devices, focusing on their material characteristics such as electronic, optical, piezoelectric, magnetic, superconducting and MEMS device properties. These properties are crucial for optimizing device functionality. The session emphasizes the importance of leveraging thin film growth to tailor specific properties like electrical and thermal conductivity, optical properties, thermal and mechanical stability, and magnetic characteristics to meet diverse device requirements. Furthermore, the session covers emerging trends in the electronics industry and their implications for thin film applications. It includes advancements in CMOS and beyond CMOS nanoelectronics, advanced sensors, low-power IoT devices, solid-state lighting, and flexible displays. These developments highlight the role of functional thin films in enabling cutting-edge technologies. Scalable, cost-effective, and environmentally friendly thin film deposition processes are discussed, considering various substrates including flexible materials. The session also examines innovative thin film deposition manufacturing techniques such as vacuum-based technologies, and ink technology, along with advancements in testing and characterization methods for thin films. Join this session to gain insights into the latest research and advancements in functional thin films for electronic devices. Discover how these films enhance device performance, adapt to industry trends, and contribute to breakthroughs in sensing, connectivity, AI, and quantum computing.

MB2: Thin Films for Electronic Devices

Vimal Kamineni, PsiQuantum Ltd., USA, “Electro-optic Thin Film Switch for Silicon Photonics Quantum Computer”

Xiuling Li, The University of Texas at Austin, USA, "Miniaturizing Passive Electronic Components by the Self-Rolled-Up Thin Film Technology"

MB3. Nanomaterial-based Thin Films and Structures

This session focuses on harnessing nanoscale phenomena and innovative deposition strategies for nanomaterial-based thin films and coatings with application-oriented functionalities. Advances in the formation and applications of thin films made of nanocrystals, nanoparticles, nanowires and other types of nanostructures, as well as the development of novel synthesis technologies will be addressed. The areas of interest include experimental, theoretical, and computational research in nanomaterial-based films with controlled properties, processing-

structure-property relationships, novel application concepts or prototypes using nanoengineered structures. Thus, the session will provide a unique platform for the discussion of fundamental issues and recent developments in the synthesis of novel functional nanostructured materials as well as the ways to apply them in the next generation of research and manufacturing processes.

MB3 Invited Speakers:

Lidia Martinez, ICMM, CSIC, Spain, "Dual Scale Structures Based on Nanocolumns and Nanoparticles"

MB4. 2D Materials: Synthesis, Characterization, and Applications

This session focuses on exciting developments in the field of 2D materials, including but not limited to graphene, transition metal dichalcogenides (MoS2, WS2, etc.), BN, oxides, as well as emerging 2D carbides and nitrides. 2D materials have been extensively researched in the last decade as atomically-thin metal, semiconductor, and insulator materials with novel and extraordinary properties. Recent advances in their synthesis have provided new possibilities to tune their structure, properties, and enhance their electrical, mechanical, lubrication, andanticorrosion performances. Researchers working in the field of 2D material synthesis and processing, characterization, and applications are encouraged to submit abstracts. We seek to advance the research and development of 2D material-based coatings by connecting researchers from diverse academic and industrial backgrounds, including tribology, materials science, physics, and chemistry. Topics include: controlled scalable synthesis of 2D materials, composite materials and heterostructures, mixed 2D phases and alloys, formation and control of defects, grain boundaries, edges, interfaces, nanopores, characterization, theoretical modelling, device fabrication, post-synthesis engineering of 2D materials using chemical treatments and ion/electron beams, and applications of 2D materials in electronics, sensing, coating, friction/wear reduction, anti-corrosion, and anti-fouling.

MB4 Invited Speakers:

Miin-Jan Cheng, National Taiwan University, Taiwan

MB5: Functional Thin Films and Surfaces (Symposium MB) Poster Session

Symposium MC (Materials C): Tribology and Mechanics of Coatings and Surfaces

This symposium covers all aspects of tribology, mechanical properties, and adhesion of coatings and engineered surfaces. The scope includes both experimental investigations and modeling of static (e.g., indentation and adhesion) and dynamic (e.g., oscillating, scratching, sliding, and rolling) contacts, and contact/fracture mechanics from atomistic to macroscopic length scales. We welcome contributions that improve scientific and mechanistic understanding of tribo-mechanical responses, characterization and performance of engineered surfaces and coatings, processing-structure-property-performance relationships, design of coatings for specific applications, and size effects. Additional emphasis is given to multifunctional (hard and lubricious) and nanocomposite coatings for extreme environments, nanostructured coatings, diamond and diamond-like carbon, and coatings for advanced aerospace, automotive, and machining applications, along with advances in instrumentation and measurement techniques.

MC1. Friction, Wear, Lubrication Effects, & Modeling

This session covers all phenomena related to friction, wear, lubrication, and modeling. We solicit contributions on the development, characterization and modeling of materials, coatings or innovative structures to control friction and wear, including liquid and solid lubrication. We are interested in studies providing new understanding of tribological mechanisms of coatings and thin films. Emphasis will be given to contributions on understanding the role of coating composition and structure in friction and wear reduction. Incorporation of additional coating functionalities (thermal cycling resistance, fracture toughness, oxidation resistance, etc.) is also an important issue. Contributions on theoretical and computational modeling of tribological interactions at the atomic or molecular level are also welcome.

MC1 Invited Speakers:

Michael Berger, Fraunhofer IKTS, Germany, "High Entropy Carbides for Thermal Spray Coatings"

Angela Pitenis, UC Santa Barbara, USA, "Fragile Films"

Thomas Scharf, University of North Texas, USA, "Modern Analytical Methods for Characterizing Wear Surfaces and Subsurfaces"

MC2. Mechanical Properties and Adhesion

This session is devoted to the measurement and modeling of mechanical properties of surface and near-surface regions of thin films, coatings, and surface-engineered bulk materials. We are interested in measurement methods

and models for the quantitative determination of mechanical properties, residual stresses, interface adhesion, fatigue, and fracture toughness. Emphasis will be given to contributions on novel test methods, such as in situ testing in SEM or TEM, multi-axial contact mechanics, MEMS test beds, and new approaches for the extraction of mechanical and constitutive properties by modeling of indentation load-displacement curves. Finally, special consideration will be given to contributions that address processing-structure- mechanical property relationships across multiple length scales.

MC2 Invited Speakers:

Matteo Ghidelli, Laboratoire des Sciences des Procédés et des Matériaux (LSPM), CNRS, Université Sorbonne, France, "Boosting Mechanical Properties of Metallic Thin Films Through Advanced Nanoengineered Design Strategies"

Szilvia Kalacska, Georges Friedel Laboratory, MINES Saint-Etienne, France, "In Situ Micromechanical Characterization of Thin Films: Strain Rate, Size and Microstructure Related Experiments in the SEM"

MC3. Tribology of Coatings and Surfaces for Industrial Applications

Surface engineering and advanced coatings contribute to improved tribological properties and performance in many industrial applications. This session welcomes contributions on the development, characterization, and mechanical as well as tribological evaluation of coating solutions and surface functionalization in industrial applications, e.g. transportation, production technology. Thin film coatings, diffusion treatments as well other types of coatings and surface treatments are welcome. Special consideration will be given to contributions that address overarching investigations to link fundamental insights with application results.

MC3 Invited Speakers

Maria Isabel De Barros, Laboratory of Tribology and System Dynamics Ecole Centrale de Lyon, France, "Interactions between coatings/surfaces and lubricants"

Steffen Hoppe, Federal-Mogul Holding Deutschland GmbH, Germany, "Tribological Coatings to meet Future Requirements for Green Mobility"

MC4: Tribology and Mechanical Behavior of Coatings and Engineered Surfaces (Symposium MC) Poster Session

Symposium MD (Materials D): Coatings for Biomedical and Healthcare Applications

This Symposium focuses on the synthesis, characterization, and performance (both in vitro and in vivo) of coatings and modified surfaces designed for biomedical applications (biomaterials, bioimplants, biosensors, general health care, etc.). The symposium will be devoted to creating a platform, a friendly hub, to promote research discussions between material scientists, coating experts, and clinicians. Papers are solicited in areas related to bioactive and biocompatible coatings for implants (orthopedic, dental, spinal, etc.), cardio-vascular stents, drug delivery, biosensing. Examples of research topics sought are hydroxyapatite coatings, biomimetic and bio-inspired coatings, antimicrobial, anti-biofouling, drug-eluting coatings, blood-compatible coatings, electrospun coatings, biofunctionalization of materials surfaces such as tissue engineering scaffolds by wet chemical and plasma methods, cell-surface interactions, bio-lubrication and bio-tribology, and processing and characterization of biomaterial surfaces. Studies of the interactions between coatings and the biological environment, including tribocorrosion and other degradation mechanisms are also welcome. Moreover, research on the effect of biomaterial coatings on biological behavior, such as cell growth, adhesion, and gene expression are sought. Contributions in the fields of retrieval implant analysis, the release of metal ions/particles, smart/intelligent surfaces and potential clinical concerns will be also considered. A new key interest is applications of coatings in additive manufacturing, as many novel 3D-printed implants benefit from surface coatings to promote osseointegration and more generally biocompatibility.

MD1. Surface Coatings and Surface Modifications in Biological Environments

The purpose of this session is to specifically address coatings and surface modifications utilized in biomedical applications. These modifications aim to enhance the performance characteristics or provide additional functionalities to implants, medical devices or surgical instruments. The coatings and surface modifications serve various functions, including improving attributes such as biocompatibility, promoting cell proliferation and viability, reducing restenosis, preventing thrombus formation, regulating metallic ion release, and offering resistance to corrosion and wear. These functionalities are evaluated in both laboratory settings (in vitro) and within living organisms (in vivo).

MD1 Invited Speakers:

Sima Alidokht, McGill University, Canada, "Tribology of Cold Sprayed Coatings for the Biomedical Application"

Po-Chun Chen, Institute of Materials Science and Engineering, National Taipei University of Technology, Taiwan, "Iridium Oxide Based Thin Film as a Electrode for Bio-Interface Applications"

MD2. Medical Devices: Bio-Tribo-Corrosion, Diagnostics, 3D Printing

Metallurgical materials are essential components of medical devices used to restore biological function, detect or respond to physiological or external stimuli, or modulate the response of cells at interfaces. This session seeks to explore clinical applications and physiological responses to material systems used for tissue regeneration, implantable sensors, and smart drug delivery, among others. Fabrication and testing of these materials using additive manufacturing technologies are of particular interest. Research is solicited that evaluates biological reactions to implant surface coatings as well as methods of depositing coating particles of varying size and composition. Release of molecules or particles from surfaces, either intentionally or due to wear and corrosion processes is also an area of interest.

MD2 Invited Speakers:

Mostafa Bedewy, University of Pittsburgh, USA

MD3. Bioactive Surfaces

The communication between cells and biomaterials takes place through the surface of the biomaterials. The surface characteristics encompass its topography, chemistry, mechanical properties, surface energy, and redox potentials. These interactions initiate either desirable or undesirable processes. For instance, they can activate signaling pathways that regulate cell adhesion, migration, proliferation, and differentiation into specific desired cell types for various applications. However, they can also facilitate excessive adhesion of microorganisms, leading to the formation of biofilms that pose significant health risks. Gaining a comprehensive understanding of these interaction processes and their relationship with surface properties is crucial knowledge that enables us to create new surfaces or coatings capable of promoting specific biological responses, thereby designing bioactive surfaces.

MD3 Surfaces Invited Speakers:

Aleksey Yerokhin, University of Manchester, UK

MD4: Coatings for Biomedical and Healthcare Applications (Symposium MD) Poster Session

Symposium CM: Advanced Characterization, Modelling and Data Science for Coatings and Thin Films

This Symposium focuses on recent advances in microstructural, chemical, electrical, optical, and mechanical characterization of coatings and thin films, as well as advanced modelling and computation techniques, which enhance our understanding of the fundamental structure-property-processing relationships. In addition, the symposium will cover topics related to high-throughput thin film development including combinatorial synthesis, automated characterization and data science approaches such as machine learning or artificial intelligence for large data processing. Of interest are contributions that either highlight the application of recent advances in analytical methods, characterization techniques and nano-mechanical testing methods for coating evaluation, or present advanced and innovative modelling techniques to understand coating properties.

CM1: Spatially-resolved and in situ Characterization of Thin Films, Coating and Engineered Surfaces

This session deals with all aspects concerning novel spatially-resolved structural, microstructural and chemical characterization techniques, especially those that advance the in-depth understanding of the relationship between the processing, the structure and the properties of thin films and engineered surfaces. Particular attention will be given to papers using cutting-edge experiments to provide information both during and post-growth microstructural investigation. Papers are furthermore also solicited in the emerging area of three-dimensional microstructural characterization in small volumes, such as FIB/SEM/EBSD tomography and ToF-SIMS 3D mapping, dynamic characterization of thin film growth, operando cutting experiments, nanoindentation, ellipsometry, wide- and small-angle X-ray/neutron scattering, reflectometry, TEM characterization, micro-Raman spectroscopy, etc.

CM1 Invited Speakers:

Jens Birch, Linköping University, Sweden

Aleksandr Goikhman, Koenigs Systems, Germany

Marie-Ingrid Richard, CEA Grenoble, France

Lillian Vogl, UC Berkeley, USA

CM2: Advanced Mechanical Testing of Surfaces, Thin Films, Coatings and Small Volumes

This session covers advanced mechanical characterization techniques for surfaces, thin films and coatings with a focus on the development of novel methods. This includes novel methods for performing nanoindentation and advanced micro-scale testing on coatings, thin films and nanostructures produced by FIB or other lithography techniques. Particular attention will be given to papers providing characterization in non-ambient and extreme conditions (harsh, cyclic and/or unusual conditions, such as high or cryogenic temperatures, radiation and high strain rates). Emphasis will be given to multi-techniques nanomechanical testing, performed in situ in the SEM, TEM, Raman, X-ray beamline, etc. Papers are furthermore also solicited in hydrogen characterization and its effect on the deformation mechanism and embrittlement of coatings and thin films.

CM2 Invited Speakers:

Jazmin Duarte, Max-Planck Institut für Eisenforschung, Germany
Peter Felfer, Friedrich-Alexander University, Germany
Subin Lee, Karlsruher Institut für Technology, Germany

CM3: Accelerated Thin Film Development: High-throughput Synthesis, Automated Characterization and Data Analysis

This session covers all topics related to accelerated, high-throughput thin films and coatings development. This includes studies on rapid thin film materials development and coatings optimization but also recent advances and developments in high-throughput research methods. Of particular interest are advanced approaches for synthesis, such as combinatorial or autonomous thin film deposition, but also automated characterization techniques. An emphasis is put on the role of data, the efficient handling of large data sets as well as the application of data science techniques and machine learning to high-throughput experimental workflows. This session complements CMD4 which focusses on advanced theoretical approaches for materials discovery and design.

CM3 Invited Speakers:

Alfred Ludwig, Ruhr-Universität Bochum, Germany
Jennifer Rupp, Technical University of Munich, Germany
Shijing Sun, University of Washington
Andriy Zakutayev, National Renewable Energy Laboratory, USA

CM4: Simulations, Machine Learning and Data Science for Materials Design and Discovery

This session presents computational and simulation methods, machine learning, artificial intelligence, visualization algorithms, as well as best practices of their applications for knowledge-based materials design and discovery. It welcomes contributions devoted to (1) aid understanding of material structures and properties based on computations and simulations spanning from the atomic level to macroscale, (2) use of machine-learning algorithms for describing material properties or rapidly screen compositional landscapes, (3) generation, curation, and exploration of big materials data from a wide range of sources, including computations and experiments. Additionally, (4) predictive process modeling and simulations will be discussed as a tool which provides irreplaceable insight into process conditions and quantities which cannot be measured. Process modeling provides an additional layer of physics-based metadata that can be leveraged by machine learning and AI methods. This session complements CMD3 focusing on experimental high throughput synthesis, characterization and data analysis.

CM4 Invited Speakers:

Nikola Koutna, TU Wien, Austria, "Nanoscale Simulations of Deformation and Fracture via Machine Learning Assisted Molecular Dynamics"
Moritz To Baben, GTT-Technologies, Germany, "DFT+ ML + Calphad: From Qualitative to Quantitative Phase Stability Predictions"
Kenneth Vecchio, University of California San Diego, USA

CM5: Advanced Characterization, Modelling and Data Science for Coatings and Thin Films (Symposium CM) Poster Session

Symposium IA: Surface Engineering - Applied Research and Industrial Applications

This symposium will focus on applied research related to industrial manufacturing and application aspects of various surface engineering and coating technologies. Topics include recent advancements in surface engineering equipment and the application of PVD/CVD deposition technologies for coatings and thin films in automotive, aerospace, component and tooling/cutting applications. Also of particular interest are surface treatments before and after the coating processes to enhance the performance of engineered surfaces, hybrid/duplex coating techniques, innovations in manufacturing practices, and cooperation between industry, research organizations, and academia to advance surface engineering applications.

IA1: Advances in Application Driven Research and Hybrid Systems, Process and Coatings

The scope of this session is on the research results produced in cooperation between industry, research laboratories, and academia. One focus should be on companies that can present current status and achievements, as well as to address future development trends. Academic institutions are highly encouraged to present results of background research or contributions aimed at the development of the tailored solutions to meet the industrial demands of thin film and hard coatings applications.

IA1 Invited Speakers:

IA2: Surface Modification of Components in Automotive, Aerospace and Manufacturing Applications

This session will cover application-oriented research and development on surface engineered products and technologies. Topics include surface modified or coated products/components in tribology, corrosion, high temperature, optical, magnetic, and allied technologies. The focus is also on novel substrate preparation and pre-treatment methods: nitriding, carburizing, boriding, or oxidation pre-treatments; intermediate etching treatment and interlayer design during the coating processes. The innovative technologies such as coating post-treatments, including laser, electron beam, annealing, ion implantation or mechanical/chemical/optical techniques, and integrated and/or novel treatments and process combinations are also of interest. The main criteria are that the surface engineering/coatings should be applied to semi/end products to enable/improve desired physical/chemical properties. The components used in automotive, aerospace, manufacturing, land-based and aero turbines, mining, oil drilling and fracking, construction machinery, sporting goods and farming equipment are of primary interest in this session. Papers dealing with aspects relating to properties, processes, performance, equipment, and industrial applications for such treatments are all welcome.

IA2 Invited Speakers:

Anirudha Sumant, Argonne National Laboratory, USA, "Nanolubricants: Pioneering Sustainable Solutions for the Lubrication Industry"

Ann Bolcavage, Rolls Royce, US, "Surface Engineering in Support of Sustainable Aviation"

Tanvir Hussain, University of Nottingham, UK

Li Li, Blue Origin, USA, "Sustainable Surface Engineering in Space Programs"

IA3: Innovative Surface Engineering for Advanced Cutting and Forming Applications

The requirements of manufacturing industries and recent innovative developments in coatings and surface engineering processes for advanced tooling applications are the focus of this session. Such applications include but are not limited to high-demanding sheet or bulk metal forming, plastics processing, die-casting as well as cutting operations of steel, cast iron and difficult-to-cut materials like high-temperature alloys or CFRP. Novelties related to the use of coating technologies like PVD arc, sputtering, HIPIMS, hybrid, electron beam as well as PECVD and CVD for application-oriented design of different coating materials, architectures and properties are welcome. Insights into the combined effect of tool geometry and adapted coatings are also in the focus of the present session. Furthermore, contributions highlighting the interaction of the coatings designed for cutting and forming applications with the ambient atmosphere and/or the counterpart materials including metallic alloys and polymers are within the focus of this session.

IA3 Invited Speakers:

Klaus Pagh Almtoft, Danish Technological Institute, Denmark, "Challenges Dealing with Industrial Coating Development and Tailor-Made Production"

Alessandro Bertè, Lafer Rivestimenti, Italy

IA4: Surface Engineering - Applied Research and Industrial Applications (Symposium IA) Poster Session

Symposium TS: Topical Symposium on Sustainable Surface Engineering

The United Nations (UN) have defined 17 Sustainable Development Goals (SDG) to pave the way for a future which is worth living for everyone. This mindset is emphasized at the 50th ICMCTF with the tagline Surface Engineering for Sustainable Development. While sustainability aspects are more than welcome in all contributions to the conference, the 50th ICMCTF features for the first time a focused Topical Symposium on Sustainable Surface Engineering to manifest the fact that state-of-the-art research and development in surface engineering must also account for sustainability. Individual topical sessions on batteries and hydrogen applications, sustainable processing and materials selection, solar thermal conversion, catalysis and thermoelectrics as well as circular strategies for surface

engineering are in line with SDG 7 'Affordable and Clean Energy', SDG 12 'Responsible Consumption and Production' as well as SDG 13 'Climate Action.'

TS1. Coatings for Batteries and Hydrogen Applications

The future of energy is driven by the overall goal to provide green and sustainable energy for all industrial sectors. All mobile and stationary applications will be affected by these changes. The achievement of these goals relies on green and sustainable energy generation but also on the ability to store this energy. Once electricity is generated with regenerative technologies it can be stored in batteries or transported using hydrogen as a carrier to its final destination and transferred to electricity again when needed. Electrochemical cells are key elements in hydrogen production and storage of generated electricity in batteries. Surface coatings and surface functionalization in these cells are providing key properties to enable and drive necessary reactions. Electrode surfaces must provide high electric conductivities and withstand harsh electrochemically corrosive environments. On the other hand, membrane assemblies must be functionalized and act as carriers for catalysts. In solid-state batteries coatings are needed for interface design between electrodes and electrolytes. Moreover, coating processes are needed for the application of active materials. Future technical and economic success in hydrogen generation and electricity storage is mainly driven by the developments related to these electrochemical cells. This topical session focuses on coatings and surface functionalization in electrochemical cells used in hydrogen applications, e.g. electrolysis, fuel cells, and in electricity storage, e.g. Li-batteries, solid state batteries, flow batteries.

TS1 Invited Speakers:

Tsan-Yao Chen, National Tsing Hua University, Taiwan , "Single Atom Catalyst for Fuel Cells"

Thomas Kolbusch, Coatema, Germany, "New Coating Methods for New Electrolyzer Technologies for PEM Electrolyzer and AEM Electrolyzer"

TS2. Sustainable Processing and Materials Selection for Surface Solutions

The session is intended for engineers and scientists working in all fields between fundamental research, product development and manufacturing by surface modification processes. The full scope of surface modifications like chemical or physical processing, material deposition or removal in dimensions of nanometers to some hundred microns shall be considered to generate functional surfaces. The focus is on the complete range from process and materials to applications with the goal to minimize or even to eliminate negative environmental impact, and perhaps also to improve environmental conditions. This includes aspects of material selection, hardware for processing and applications. Surface solutions have the potential to enable sustainable solutions for functionalized and even smart surfaces, but surface solutions in itself should also be sustainable. Innovative ideas for new pathways to generate sustainable processes. The surface modification process in general or, as an example, a coating deposition process has to be designed for sustainability including the adequately targeted durability, the effort and waste for production and the recyclability at the end of life. This includes an assessment of the total GHG (greenhouse gas) impact and the release of harmful substances. Selected keys are listed below.

- Impact measure for the total carbon footprint for any resource to adjust surface properties (utilization and energy efficiency).
- Low-impact materials (non-toxic, recycled materials) both for the surface and for intermediate steps are of special interest.
- Sustainability aspects in pre- and post treatment processes.
- Tailored components of the deposition (treatment) equipment's (PVD, CVD; Spraying, Nitriding and others) and the processes themselves are steps to achieve a progress in sustainability, e.g. to reduce energy consumption (e.g. low temperature processes, avoiding high vacuum conditions), and pollutions.
- Sustainable Surface Solutions should not be reduced to wear and/or friction reduction. Pathways of sustainable solutions based on various deposition (treatment) processes self-cleaning surfaces, coatings on plastics, optical coatings, medical coatings, decorative coatings, antifouling coatings, corrosion protection coatings, sensoric and electronic coatings shall be highlighted.

TS2 Invited Speakers:

Wei-Hung Chiang, National Taiwan University of Science and Technology, Taiwan , "Microplasma-Enabled Upcycling for Nanomaterials Synthesis and Applications"

TS3. Solar Thermal Conversion

Solar thermal conversion is a promising method for harnessing solar energy and converting it into useful forms of energy. This technology involves the use of materials and thin films that can absorb and convert sunlight into heat energy, which can be used for a variety of applications, including electricity generation, water heating, and space

heating. With the increasing demand for renewable and sustainable energy sources, photothermal conversion has gained considerable attention in recent years, and research in this area has led to the development of coatings/thin films as well as innovative technologies with improved efficiency and performance.
The session will encompass an extensive array of topics aimed at advancing solar thermal technologies. These topics will explore the development of various coatings and thin films, including absorber coatings, reflectors, and transparent covers, as well as novel fabrication processes. The emphasis will be given on characterizations, testing techniques, and the evaluation of materials' performance and durability in concentrated solar power (CSP) systems. Furthermore, discussions will revolve around material selection and optimization for applications such as solar water heaters, solar cooking, thermal energy storage, and other industrial processes reliant on solar thermal energy. The session will also delve into the exciting advancements in window materials, integrating photothermal and radiative cooling processes to enhance energy efficiency within buildings. Moreover, attention will be given to innovative solar thermal building materials that facilitate efficient capture, storage, and distribution of solar energy in structures. Additionally, the session will highlight the application of solar thermal technology in water desalination, purification, and wastewater treatment, showcasing sustainable and cost-effective processes that utilize solar energy for evaporation and condensation. These topics, along with others, emphasize the diverse and exciting developments in the field of solar thermal technology.

TS3 Invited Speakers:

Renkun Chen, University of California San Diego, USA, "Development and Thermal Characerization of High-Temperature Coating Materials for Solar Thermal Energy Conversion"

Ramon Escobar Galindo, University of Sevilla, Spain, "Application of Surface Engineering Solutions in Concentrating Solar Power Key Components"

Audrey Soum-Glaude, PROMES-CNRS Laboratory, France, "Smart Coatings for Concentrated Solar Thermal: From Optical Design and Plasma Synthesis to Performance and Durability Assessment"

TS4. Coatings and Surfaces for Thermoelectrical Energy Conversion and (Photo)electrocatalysis

Energy conversion constitutes a fundamental challenge of today's society. For example, as thermal energy and CO2 are continuously lost and produced, respectively, developing materials, devices, and methods to reuse them will allow for a more sustainable future. This session is particularly dedicated to the materials and devices developed for thermoelectrical and (photo)electrochemical energy conversion. It will cover theoretical and experimental work on the design, processing, characterization and performance of materials and devices developed for thermoelectrics and advanced catalysts. We welcome contributions on the following:

- Inorganic and organic-based thin film thermoelectrics
- Characterization of thermal properties in thin films
- Development of thermoelectric devices
- Material replacement of critical elements in thermoelectrics
- Design and synthesis of novel catalysts (CO2RR; HER, OER, NH3)
- Vapor-based synthesis of catalytic 2D materials and nano-objects
- Material replacement of critical elements in catalysts
- Approaches of nanoscale design, synthesis, and functionalization
- Characterization of (photo)electrochemical activity (including *in operando*)
- Theoretical approaches for modeling catalytic processes
- Mechanisms of photo/electrocatalysis

TS4 Invited Speakers:

TS5. Circular Strategies for Surface Engineering

The concept of a circular economy is a key element towards reaching the sustainable development goals (SDG) from the United Nations (UN) and comprises incentives to reuse existing products, instead of disposal and relying on the continuous global production for replacement. 'The goods of today are the resources of tomorrow at yesterday's resource prices'. Thus, natural resources can be used more efficiently, and also new markets will evolve in a circular economy. In the last decades, the research and development within surface engineering has been focused mainly on the enhancement of surface properties by design of multifunctional coatings and surfaces, while the sustainability of such processes and products is usually neglected. However, the approach of a circular economy for surface engineering requires innovative rethinking along the lines of reduce, reuse, repair and recycle. These strategies exhibit both ecologic as well as economic incentives, which means that the significant lowering of greenhouse gas emissions during production is closely connected to business models for the future. Sustainability measures have

been widely implemented and exploited for immediate actions to enhance the longevity of products and materials within industrial surface engineering in the last years. On the other hand, insights and knowledge from basic academic research offer additional opportunities to enhance the sustainability of surface engineering products. Hence, this topical session provides a bridging platform for exchange on circular economy strategies for surface engineering between industry and academia. This exchange will benefit from innovative contributions on e.g., approaches for life cycle analyses, reduction of energy and material input, reusage of bi-products as well as repair and recycling of materials.

TS5 Invited Speakers:

Lars Johnson, Sandvik Coromant, Sweden, "Perspectives on Sustainability of Coated Cutting Tools"
Uwe Schleinkofer, CERATIZIT Austria GmbH, Austria, "Coated Cemented Carbides – Tooling a Sustainable Future"

TS1P: Coatings for Batteries and Hydrogen Applications - TS1 Poster Session
TS2P: Sustainable Processing and Materials Selection for Surface Solutions - TS2 Poster Session
TS3P: Solar Thermal Conversion - TS3 Poster Session
TS4P: Coatings and Surfaces for Thermoelectrical Energy Conversion and (Photo)electrocatalysis - TS4 Poster Session
TS5P: Circular Strategies for Surface Engineering - TS5 Poster Session

SPECIAL SESSIONS & EVENTS

Plenary Lecture (PL)

Prof. Yuri Gogotsi, A.J. Drexel Nanomaterials Institute, Dept. of Materials Science and Engineering, Drexel University, USA

"Engineering 2D MXene Surfaces for Functional Films and Coatings"

Monday, May 20, 2024, 8:00 a.m.

MXenes (carbides, nitrides, oxycarbides and carbonitrides of early transition metals) are a very large family of 2D materials. They have a chemical formula of $M_{n+1}X_nT_x$, where M is a transition metal (Ti, Mo, Nb, V, Cr, etc.), X is either carbon and/or nitrogen (n=1, 2, 3 or 4), and T_x represents surface terminations (O, OH, halogens, chalcogens). The large variety of structures and compositions, availability of solid solutions on M and X sites, and control of surface terminations offer a plethora of materials to produce and investigate.[1] Combining their plasmonic properties with ease in aqueous processing, high electronic conductivity (over 20,000 S/cm), biocompatibility, and excellent mechanical properties, which exceed other solution-processable 2D materials, MXenes have the characteristics enabling numerous applications.[2] Inherent to their 2D structure, the charge carriers responsible for MXene's optical responses and electronic transport are very close to the surface that has an exceptional ability to undergo reversible chemical and electrochemical reactions to add or change surface terminations. MXenes can be applied to a variety of surfaces to provide electronic and ionic conductivity, control optical properties in a wide range of wavelengths, produce electrochromic films, and even achieve a low friction coefficient. Polymers, paper, and fabrics coated by MXenes from aqueous or organic solutions acquire unique surface properties. The properties of MXene coatings can be optically or electrochemically modulated. Many technological advances can be enabled by these chemically and optically responsive conductive coatings.

Exhibitors Keynote Lecture (EX)

Dr. Samuel Chiu, Senior Technical Director, Applied Materials, Taiwan

"Material Innovations and Challenges of Thin Films and Plasma Applications for 3 nm Node and Beyond""

Tuesday, May 21, 2023, 11:00 a.m.

The inventions of integrated circuits (1958) and the prediction of Moore's Law (1965) will celebrate its 66th and 59th anniversary in 2024, respectively. The foundation of semiconductor industry and its amazing achievement has dramatically changed the way we live. With the advents of Artificial Intelligence (AI), Machine Learning and AR/VR (Artificial Reality, Virtual Reality) applications enabled by advanced semiconductor technology, there are high hopes we will see significant breakthrough in many areas such as vaccine research, auto-pilot, astro-physics and super computing, etc.Taiwan plays a critical role as a hub of semiconductor R&D and manufacturing for the past several decades. In this presentation, the latest innovation of thin film materials and plasma-related process to drive the success of advanced technology nodes will be described. Furthermore, the future challenges and opportunities beyond 3nm nodes in order to keep Moore's Law alive will also be presented.

Keynote Lectures (KYL)

A special feature of highlighted presentations offers added value to the technical program. Lectures are dedicated to topics of fundamental interest for scientists and engineers in surface engineering. Presentations are individual and not "classic" day-to-day R&D business. Discussion of new developments and trends of relevance to ICMCTF, both in materials science and in methodology, in a pioneering state, with long-term impact. Selected critical reviews in a field of relevance to ICMCTF. Recognition of colleagues with pioneering and lasting impact on ICMCTF.

KYL1: Keynote Lecture I
KYL2: Keynote Lecture II

'FIRST TIMERS' SPECIAL

We want to welcome new participants in 2024 with a special `First Timers` offer of ***free student registration*** for one student accompanying their adviser/supervisor registering for ICMCTF 2023 for the first time. Both the mentor and student must be first time attendees, and both are required to stay in the conference hotel to be eligible for the offer. Please contact the ICMCTF 2024 General Chair, Jyh-Wei (Jeff) Lee (jefflee@mail.mcut.edu.tw) if you have any questions regarding this opportunity.

ICMCTF VENDOR EXHIBIT

Visit the exhibit hall on Tuesday, May 21, from 12:00-7:00 p.m. and Wednesday, May 22, from 10:00 am – 2:00 p.m. to learn about new products, services and application techniques that will help improve all facets of R&D, Engineering, Manufacturing, Quality Control and general laboratory operations. This is a great opportunity for attendees to interface with vendors who are eager to introduce their products that will satisfy your laboratory requirements and your specific research criteria. The exhibit hall is also a great place for networking. Join us each day for lunch and the exhibit hall reception on Tuesday at 5:30 pm. For questions regarding the exhibits, please contact Jeannette DeGennaro at jeannette@avs.org

Call for ICMCTF Awards

1. ***Graduate Student Awards:*** The ICMCTF Graduate Student Awards are intended to honor and encourage outstanding graduate students in fields of interest to the Advanced Surface Engineering Division (ASED) of the AVS. ASED seeks to recognize students of exceptional ability who show promise for significant future achievement in ASED-related fields. The nominee must be a graduate student in science or engineering who is in good standing at a university with a recognized graduate degree program and the presenting author of an oral presentation at the annual ICMCTF conference. Nominees who receive their final research degree after the ICMCTF Abstract Submission deadline are still eligible for that year. However, previous Graduate Student Award winners are ineligible. Submission Deadline: November 15, 2023. Click here for **Nomination Procedures.**

2. ***Bunshah Award:*** R.F. Bunshah Award and Honorary ICMCTF lectureship is intended to recognize outstanding research or technological innovation in the areas of interest to the Advanced Surface Engineering Division (ASED) of the AVS, with an emphasis in the fields of surface engineering, thin films, and related topics. The nominee shall have made pioneering contributions to the science or technology of surface engineering, thin films, or related fields of interest to ASED. Submission Deadline: November 15, 2023. Click here for **Nomination Procedures.**

3. ***Bill Sproul Award:*** The Bill Sproul Award and Honorary ICMCTF lectureship is intended to recognize the achievements of a mid-career researcher who has made outstanding scientific and/or technological contributions in areas of interest to the Advanced Surface Engineering Division (ASED) of the AVS, with an emphasis in the fields of surface engineering, thin films, and related topics. Submission Deadline: November 15, 2023. Click here for **Nomination Procedures.**

***ONLINE ABSTRACT SUBMISSION ONLY:* https://icmctf2024.avs.org/**

Deadline: 11:59 pm ET, WEDNESDAY, November 15, 2023

Supplemental data (1-2 pages, 1MB) will also be accepted via the submission site.

Instructions may be found at the website above.

****Please Note: A presenter may present one (1) ORAL AND one (1) POSTER) presentation at ICMCTF****

ORAL Sessions: Rooms will be set up with projectors, screens, microphones, and laptops (PCs).

POSTER Sessions: Each poster presenter will be allotted space that is 4 feet wide by 4 feet high. Please make your poster no larger than 46 inches wide by 46 inches high to ensure it fits nicely into the allotted space. Any Questions? Please email **icmctf@icmctf.org**