30th INTERNATIONAL MATERIALS RESEARCH CONGRESS

IMRC 2022

17th INTERNATIONAL CONFERENCE ON ADVANCED MATERIALS

ICAM – IUMRS

14 –19 August 2022

BRIEF REPORT

Foreword

The 30th International Materials Research Congress (IMRC 2022) in its annual edition, was organized by the Sociedad Mexicana de Materiales (SMM) working in partnership with the Materials Research Society (MRS) and the International Union of Materials Research Societies (IUMRS) . It was held from 14 - 19 August in Cancún, México.

Over the years, it has become the main event of materials science and engineering in Latin America and is already well recognized around the world, attracting scientists, researchers, and students from many countries, and covering a wide range of topics of interest to the international materials research community. The IMRC offers different activities such as symposia, plenary talks and special lectures, tutorial courses, invited talks, oral and posters presentations, joint meetings and workshops, a graduate programs fair, SMMater-University Chapters, a commercial high tech and scientific exhibition, technical sessions by commercial exhibitors, and other special events and activities related with the promotion and advancement in the materials science and technology field.

This year, after the havoc created by the Covid 19, for the second time we organized a hybrid IMRC in which we received 1,177 attendees on-site and 628 virtual that came from 448 institutions from 48 different countries. Of the 1,177 In-person attendees, 703 were students, 254 non-members and 220 members; and of the 628 Virtual attendees, 364 were students, 178 non-members and 86 members of the Sociedad Mexicana de Materiales.

With the IMRC 2022 we accomplished the following goals:

1. A joint event with the International Union of Materials Research Societies – IUMRS:

   The 17th International Conference on Advanced Materials – ICAM (IUMRS-ICAM 2022).

2. Eight (8) plenary talks by international leading scientists and one (1) Science, Technology, and Society lecture.
3. Seven (7) symposia clusters with 41 symposia.
4. One workshop: "Women in Science and Engineering Gender Agenda" organized by outstanding scientific and professional women in diverse science, technology, and engineering fields.
5. 11 tutorial courses to introduce and better prepare participants for the symposia.
6. IMRC 2022 Poster Awards with three sessions and three winners of first place, and MRS Spring Meeting 2021 Poster Awardees Presentations of two of the three winners.
7. Graduate Programs Fair with 24 participating institutions from Mexico and USA offering graduate and postgraduate programs in the materials science and engineering field.
8. Five (5) special events: Symposium Organizers Luncheon Conference, MRS Publishing Workshop, University Chapters poster presentation, and two professional development talks for participating students.
9. Five (5) Technical Sessions offered by commercial exhibitors at the IMRC.

10. An exhibition with 38 international commercial & scientific exhibitors representing more than 50 companies and institutions, exhibiting in 41 booths.

IMRC – ICAM Attendees

1,805 participants from 48 countries and 448 institutions, from which 1,067 of the participants were students and 738 regular members and new attendees. Of all the participants, 692 were women and 1,113 were men.

Type of Attendee	In-person	Virtual	Total
Members	220	86	**306**
Non-Members	254	178	**432**
Students	703	364	**1,067**
Total:	**1,177**	**628**	**1,805**

Composition of Attendees	
Women	692
Men	1,113
Total:	**1,805**

Plenary Lectures

PROF. FRANCESCA IACOPI

Professor School of Electrical and Data Engineering. The University of Technology Sydney, Australia

Topic: **Epitaxial Graphene on Silicon Carbide on Silicon: Towards Integrated Applications**

DR. NICK BIRBILIS

Dean and Professor, College of Engineering and Computer Science. The Australian National University, Australia

Topic: **A Contemporary Look at the Corrosion and Passivation of Engineering Alloys, What is the Current State of Knowledge?**

PROF. LUIS LIZ MARZÁN

Ikerbasque Research Professor and Scientific Director. The Basque Centre for Cooperative Research in Biomaterials (CIC biomaGUNE), Spain

Topic: **Plasmonic Nanocomposites to Monitor Tumor Metabolism**.

PROF. MATTHEW TIRRELL

Dean of the Pritzker School of Molecular Engineering, University of Chicago, USA

Topic: **Electrostatic Self-Assembly of Charged Macromolecules: New Physics and New Applications**.

PROF. SAW WAI HLA

Physics & Astronomy Department, Ohio University, Athens, OH, USA

Topic: **Quantum Molecular Machines**

PROF. DRAGOS AXINTE

Director of The Rolls-Royce UTC in Manufacturing and On-Wing Technology, University of Nottingham, Nottingham, UK

Topic: **Some Aspects of workpiece Surface Integrity when Machining Ni-based Superalloys: From Macro to Nano studies**.

PROF. NARENDRA B. DAHOTRE
Center for Agile & Adaptive Additive Manufacturing, Department of Materials Science & Engineering, University of North Texas, USA

Topic: **Laser Based Additive Manufacturing**

PROF. JOSEP NOGUÉS
ICREA Research Professor and Group Leader of the Magnetic Nanostructures Group. Catalan Institute of Nanoscience and Nanotechnology, Barcelona, Spain

Topic: **Magnetoplasmonic Nanodomes as a Novel Structure for Biomedical Applications**

Science, Technology and Society Lecture

DRA. CARMEN ENEDINA RODRÍGUEZ
Director of Higher and Intercultural Education at the Ministry of Education, México

IMRC – ICAM Organization

IMRC Chairs:

1. Patricia Zambrano, General Chair, Universidad Autónoma de Nuevo León, México.
2. Margarita Sánchez-Domínguez, Centro de Investigación en Materiales Avanzados (CIMAV), Monterrey, México.
3. Norma A. Alcantar, University of South Florida, USA.
4. John J. Boeckl, Air Force Research Laboratory, USA.
5. Facundo Almeraya, Universidad Autónoma de Nuevo León, México.

ICAM-IUMRS Chairs:

1. Leticia Torres, Centro de Investigación en Materiales Avanzados (CIMAV), Chihuahua, México.
2. Miguel J. Yacaman, Northern Arizona University, USA.
3. Soo Wohn Lee, Sun Moon University, Korea.

Abstracts Received and Accepted for the Symposia

Abstracts Received	Abstracts Accepted		
Total	Total	Oral	Poster
2,529	2,375	1,164	1,209

Symposia & Workshops

A. NANOSCIENCE AND NANOTECHNOLOGY

- A1 Protein Cages as Next Generation Nanomaterials
- A2 Colloidal Crystals
- A3 Novel Techniques and Applications in Electron Microscopy and Spectroscopy of Nanomaterials and their Heterostructures
- A4 Advanced Catalytic Materials: Nano and Bulk
- A5 Nano-Alloys: Theory, Synthesis & Characterization

B. MATERIALS FOR ENERGY CONVERSION, STORAGE, AND HARVESTING

- B1 Developing Circular Economy and Sustainable Design for Emerging Energy Technologies
- B2 Advanced Materials and Processes for CO2 Capture, Utilization, and Storage (CCUS)
- B3 Electrochemical Energy Storage and Generation: Batteries, Electrochemical Capacitors and Fuel Cells
- B4 Photovoltaics, Solar Energy Materials and Technologies
- B5 Challenges in Materials and Technologies for Energy Conversion, Saving and Storage (MATECSS)
- B6 Thermoelectric Materials for Sustainable Development

C. MATERIALS FOR SUSTAINABILITY AND ENVIRONMENTAL APPLICATIONS

- C1 Emerging Materials for Clean Energy and Environmental Remediation Applications
- C2 Sustainable Uses of Sargassum Materials: Fundamentals to Applications
- C3 Materials and the Environment
- C4 Advances on Biofuels: Materials, Characterization, Processing and Testing
- C5 Advances in Sustainable Concrete and Cement Based Materials
- C6 Photoluminescence in Rare Earth Doped Materials

D. MATERIALS PROCESSING AND DESIGN

- D1 Next Generation Metallic Lightweight Structural Materials for Ground Transportation, Electronic and Biomedical Industries **CANCELLED**
- D2 Advances in Powder Metallurgy: Materials and Processes
- D3 AMPP (NACE): Corrosion and Metallurgy
- D4 Advances in Functional Semiconducting Materials
- D5 Advanced Structural Materials: Mechanics, Properties and Applications. The Focus on Severe Plastic Deformation
- D6 Aeronautical and Aerospace Processes, Materials, and Industrial Applications
- D7 Structural and Chemical Characterization of Metals and Alloys
- D8 Nanocomposites and Multilayered Thin Films Studied in Terms of Grain-boundaries and Interfaces

E. ORGANIC AND HYBRID MATERIALS: EXPERIMENTAL AND COMPUTATIONAL ANALYSIS

- E1 Equilibrium and Beyond-Equilibrium Self-Organization in Soft Materials
- E2 Nanomaterials for Drug Delivery, Imaging, and Immuno-Enginering

E3 In Honor of Matthew Tirrell - Implications of Crowded Macromolecules: Self-Assembly, Phase Behavior and Interfacial Engineering in Confined Spaces
E4 Polymers and Nanopolymers: Chemistry, Characterization and Applications
E5 Metal and Covalent-Organic Frameworks: from Synthesis to Applications

F. BIOAPPLICATIONS, INCLUDING BIOMATERIALS, SMART TEXTILES, AND WEARABLES

F1 Innovative Smart Materials by Soft Chemistry for Flexible/Wearable and Large-Area Electronics
F2 Complex Behavior, Interfaces, and Applications of Biomembranes
F3 Phase Transitions in Advanced Functional Materials
F4 Micro and Nanostructured Materials for Biomimetics and Single-Cell Studies
F5 Materials for Health Applications: Biomaterials for Permanent and Temporary Implants, Dental, and Cosmetics
F6 Bio Physics

F. GENERAL

G1 AI-Enabled Advances in Materials Imaging, Automation, and Analysis
G2 Machine Learning for Materials Modeling and Discovery
G3 Materials in Nuclear Science and Technology
G4 Advanced Defense Materials
G5 Science of Multiferroics, Ferroelectrics, Meta-Materials, and Technological Applications to MEMS Devices
G6 La Innovación y los Mecanismos de Transferencia de Tecnología en México

WORKSHOP

W1 Women in Science and Engineering Gender Agenda

Tutorials

N°	Tutorial
T1	Characterization of Materials Sargassum: Basic Theory and Practice *Organized by the symposium: C2. Sustainable Uses of Sargassum Materials: Fundamentals to Applications*
T2	Computational Methods for Electronic Structure in Catalytic Materials and its Cases of Study *Organized by the symposium: A4. Advanced Catalytic Materials: Nano and Bulk*
T3	DC and AC Electrochemical Techniques for Interfacial Characterization *Organized by the symposium: D3. AMPP (NACE): Corrosion and Metallurgy*
T4	Fundamentals of Scanning Electron Microscopy (SEM) *Organized by the symposium: D7. Structural and Chemical Characterization of Metals and Alloys*
T5	Isolation and Characterization of 2D Bio-nanostructures: Cellulose and Chitin *Organized by the symposium: D6. Aeronautical and Aerospace Processes, Materials, and Industrial Applications*
T6	Mentoring Young Scientists: Developing Survival Skills *Organized by the symposium: B5. Challenges In Materials and Technologies for Energy Conversion, Saving and Storage (MATECSS*
T7	Nanomedicine *Organized by the symposium: E2. Nanomaterials for Drug Delivery, Imaging and Immuno-Enginering*
T8	Novel Techniques of Electron Microscopy

N°	Tutorial
	Organized by the symposium: A3. Novel Techniques and Applications in Electron Microscopy and Spectroscopy of Nanomaterials and their Heterostructures
T9	Optimizing Intermolecular Potentials Using Machine Learning for Molecular Simulations *Organized by the symposium: E1. Equilibrium and Beyond-Equilibrium Self-Organization in Soft Materials*
T10	Piezoelectric Characterization of Ferroelectric Domains by Piezoresponse Force Microscopy (PFM) by using Dual AC *Organized by the symposium: G5. Science of Multiferroics, Ferroelectrics, Meta-Materials, and Technological Applications to MEMS Devices*
T11	Properties and Advanced Characterization of Inorganic/Organic Hybrid and Organic Materials for Solar Cell Applications *Organized by the symposium: B4. Photovoltaics, Solar Energy Materials and Technologies*

IMRC 2022 Poster Awards

The three First Place winners of the Poster Sessions during the IMRC 2022 were:

1. **Jorge Aarón Castillo Hernández**
   Title: Effect of the Post-Curing Temperature in the Wear Resistance of Composites Obtained by Vacuum Infusion Process
2. **Oscar Luis Quintero Lizárraga**
   Title: Synthesis of Bismuth Halide Perovskite Photocatalysts to Produce Renewable Fuels from Co2 Photoreduction
3. **Cindy Viridiana Peto Gutierrez**
   Title: Fabrication of Microelectrodes with Large Electrochemically Active Surface Area Based on Shrink Polymer Film and Rapid Low-Cost Prototyping Techniques

Special Events

1. Symposium Organizers Luncheon Conference: "Science and Technology Research within the U.S. Army", Adam Rawlett, Ph.D., Senior Research Scientist (Materials Science), U.S. Army Research Laboratory, USA.
2. MRS Workshop: Essentials of Getting your Work Published.
3. University Chapters: Local States Poster Winners Presentation and student chapter activities report.
4. Conference: "Ciencia de los materiales, nanotecnología, sustentabilidad, diseño. ¡Todo en un lugar!" KNOVEL, Pedro Gallardo, Elsevier (for students).
5. Conference: "La importancia del talento en Ternium: Oportunidades de formación y desarrollo", José Pérez – Coordinador de Marca Empleadora, Ternium (for students).

Technical Sessions by Exhibitors

N°	Technical Session	Exhibitor
1	Consideration for High Resolution and Sensitivity on XRD Measurements, with Applications.	Anton-Paar

2	Multi-modal Surface Imaging: Combining Raman, Photoluminescence and Photoluminescence Lifetime.	Edinburgh Instruments
3	Leading the Next Generation of an XRD Compact System	Malvern Panalytical
4	Chemical Imaging with Raman, EDS & EBSD: The Complete Picture of Material Properties	WITec – Oxford Instruments
5	FIB-SEM Applications in Nanotomography	Carl Zeiss

Exhibitors

38 international high technology companies and scientific institutions in the field of materials science and engineering exhibiting in 41 booths.

BOOTH	COMPANY / INSTITUTION
43	AGILENT
8	ANALITEK
27	ANTON PAAR
6	ANYOVER - HIDEN
19	BRUKER
49	CARL ZEISS
M8	CIMICROSCOPÍA
46	CTR SCI
4	EDAX -SIPROA
32	EDINBURGH
14	ELECTRON DEVICES
38	ELECTRÓNICA COM
21 & 22	I&E FALCON
29	ICDD
9	INNOVA
12	INSTRUMENTS NANOTECH
17 & 18	INTERCOVAMEX
39	IONAUTICS
25	ISASA

BOOTH	COMPANY / INSTITUTION
2 & 28	JEOL
20	MALVERN PANALYTICAL
3 & 23	MARKTEK
42	MATERIALS RESEARCH SOCIETY (MRS)
31	METROHM MÉXICO
7	MATERIALS RESEARCH SCIENCE AND ENGINEERING CENTER (NSF) U. of Wisconsin
13	NANOCIENCIAS
30	NANOMETRIX - ALS
5	NETZSCH INSTRUMENTS
15	OXFORD INSTRUMENTS AMERICA
11	PARK SYSTEMS
26	QUANTUM DESIGN
M2	SAIDE - SISTS. AUT. E IND. DIV. ELEC.
44	SOCIETY OF WOMEN ENGINEERS - SWE
M1	TA INSTRUMENTS
10	TECNO LAB - OCEAN INSIGHT
24	THERMO FISHER SCI - FEI
16	WITec – OXFORD INSTRUMENTS
20	MALVERN PANALYTICAL

Student & Researcher Financial Support Programs

Students and Researchers were financially supported to attend and participate in the IMRC 2022 through five (5) different programs:

1. Student University Chapters. 40 students from 23 student chapters were supported to present their work and help symposia presenters during the IMRC. The support consisted of paid transportation, lodging, meals, and registration to the congress.
2. Monitors Team. 148 students (73 women and 75 men) from universities of 22 different Mexican states were supported with transportation, lodging and congress registration to help symposia presenters during the IMRC and to present their academic work (oral and poster).
3. Registration Waivers (See the next item).
4. MRS Spring Meeting Best Student Poster Awardees. Two (2) lodgings and IMRC 2022 registrations.
5. One to two nights lodging for 15 Instructors of the 11 Tutorials and 22 Instructor registration waivers, two per Tutorial.

Registration Waivers

A total of 366 Regular and Student registration waivers, and 171 for In-person students assisting symposia sessions.

1. Regular waivers: 141 In-person registrations and 45 Virtual registrations.
2. Student: 128 In-person registrations and 52 Virtual registrations.
3. Student Monitors (assisting all symposia sessions): 139 In-person registrations.
4. Student University Chapter (assisting all symposia sessions): 32 In-person registrations.

IMRC Sponsoring Organizations

- Consejo Nacional de Ciencia y Tecnología – CONACYT, Mexico.
- US Army RDECOM-Americas, US Navy ONR-G and US Air Force AFOSR, USA.

Sponsors of specific symposia and poster awards

1. G4. Advanced Defense Materials:
   US Army, US Navy, and US Air Force.
2. A1. Protein Cages as Next Generation Nanomaterials:
   Funding from CNyN-UNAM and CONACyT (grant CF-MI-6357).
3. B5. Challenges In Materials and Technologies for Energy Conversion, Saving and Storage (MATECSS):
   UNESCO Chair in Materials and Technologies for Energy Conversion, Saving and Storage, and Coatings, an Open Access Journal by MDPI.
4. C2. Sustainable Uses of Sargassum Materials: Fundamentals to Applications:
   Consejo Quintanarroense de Ciencia y Tecnología - COQCYT, B. Medina, Equipos y Material de Laboratorio.
5. Best Poster Awards – IMRC 2022:
   The Royal Society of Chemistry Journals of Digital Discovery, Materials Advances, Materials Horizons, Nanoscale, Nanoscale Advances, and Nanoscale Horizons.

Additional Information

Institutions Participation

A total of 1,805 attendees, 1,177 on-site and 628 virtual, came from 448 different institutions from 48 countries.

Participation by Country

Country	Attendees
Argentina	11
Australia	4
Austria	4
Belgium	2
Brazil	19
Canada	38
Chile	15
China	10
Colombia	75
Costa Rica	5
Cuba	5
Czech Republic	5
Ecuador	1
El Salvador	5
Estonia	1
Finland	4

Country	Attendees
France	20
Germany	11
Hong Kong	1
India	2
Israel	4
Italy	13
Japan	31
Korea	4
Martinique	2
Mexico	1,249
Netherlands	7
New Zealand	1
Paraguay	2
Peru	7
Poland	13
Portugal	6

Country	Attendees
Puerto Rico	5
Rumania	3
Russia	1
Serbia	2
Singapore	4
Slovakia	1
Slovenia	1
South Africa	1
South Korea	3
Spain	27
Sweden	4
Taiwan	2
Thailand	1
Turkey	3
United States	132
United Kingdom	38