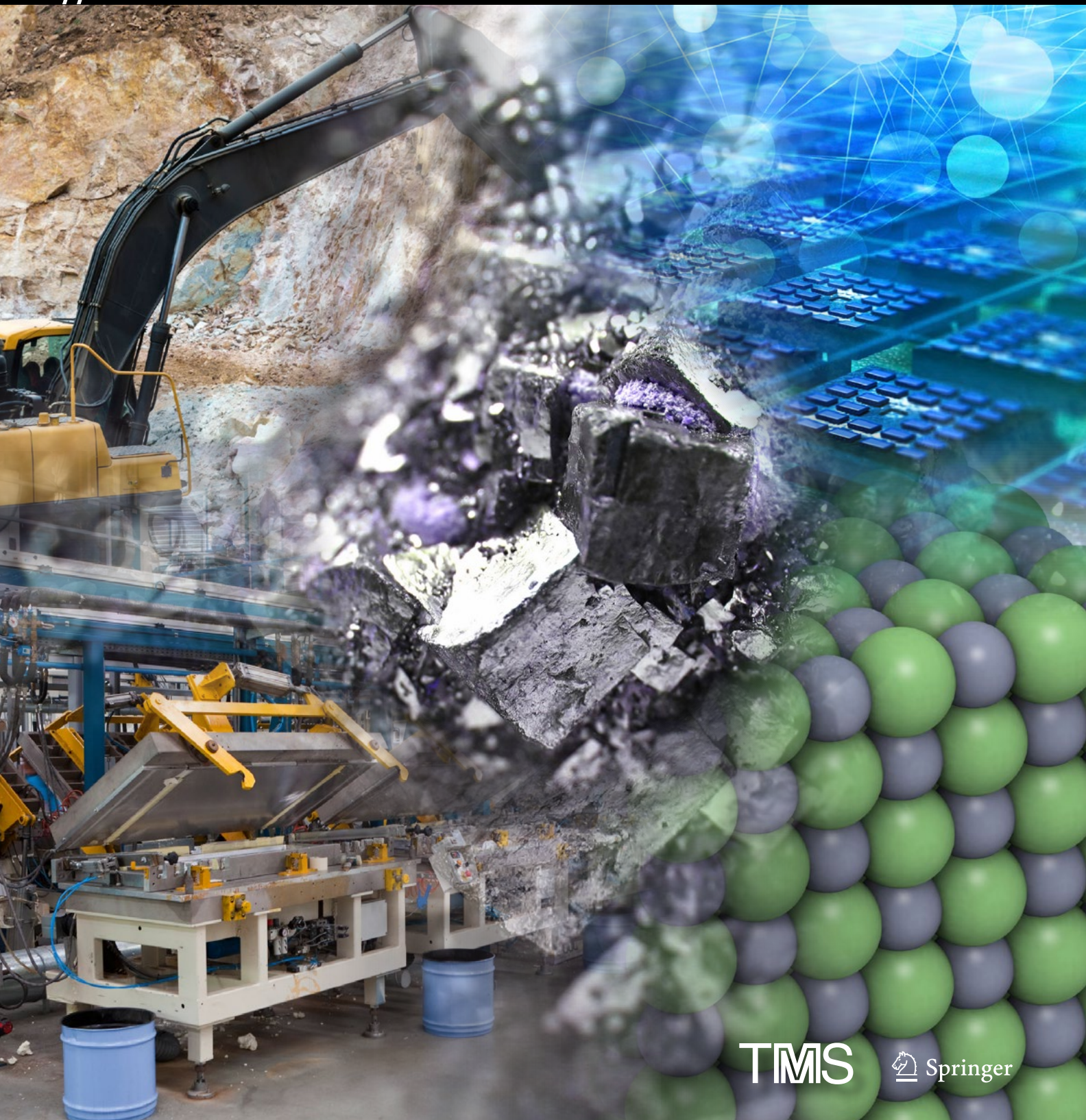


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February 2023 Guest Editors

Reprocessing and Recycling of Tailings from Metallurgical Process

*Recycling and Environmental Technologies Committee, Energy Committee, and Process
 Technology and Modeling Committee*

Hong Peng, University of Queensland; Tesfaye Fiseha, Metso Outotec; Hamuyuni Joseph,
 Metso Outotec; Iloeje Chukwunwike, Argonne National Laboratory; and Alexandra Anderson,
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About the Cover

The five cover images represent the five technical divisions of The Minerals, Metals & Materials Society: Extraction & Processing, Functional Materials, Light Metals, Materials Processing & Manufacturing, and Structural Materials. In representing the five technical divisions, *JOM: The Journal* balances the interests of its members and authors in the monthly topics and articles it publishes.

About JOM:

The scope of *JOM* (ISSN 1047-4838) encompasses publicizing news about TMS and its members and stakeholder communities and publishing high-quality peer-reviewed materials science and engineering content. That content includes groundbreaking laboratory discoveries, the effective transition of science into technology, innovative industrial and manufacturing developments, resource and supply chain issues, improvement and innovation in processing and fabrication, and life cycle and sustainability practices. In fulfilling this scope, *JOM* strives to balance the interests of the laboratory and the marketplace by reporting academic, industrial, and government-sponsored work from around the world.

About TMS:

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Publishing Information:

JOM is an official publication of The Minerals, Metals & Materials Society and is owned by the Society. TMS has granted Springer the exclusive right and license to produce, publish, archive, translate, and sell *JOM* throughout the world. Publication Frequency: 12 issues per year. Springer, 1 New York Plaza, Suite 4600, New York, NY 10004-1562, USA
JOM articles from 1949 to the present are archived at
<https://link.springer.com/journal/11837/volumes-and-issues>

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IN THE FINAL ANALYSIS

JOM
THE MAGAZINE

"If we had no winter, the spring would not be so pleasant. If we did not sometimes taste adversity, prosperity would not be so welcome."

—Anne Bradstreet

For most of its history, TMS has enjoyed steady prosperity, albeit occasionally spiced with character-building adversity such as intermittent missteps, wince-worthy decisions, and outright donnybrooks. Despite (or, perhaps, because of) such situational adversity, the Society's performance trendlines have been positive and up-curving. Decade after decade, TMS has consistently and successfully pursued its nobler aspirations, provided meaningful platforms to advance science and technology, and applied its reputation and influence in service of the global materials community.

Even during the pandemic, TMS volunteers and staff were tireless in staying the course by any means available, including endless adaptation, pivots, and innovation. The efforts were not without a downside as revenue streams were disrupted, and we started spending more than we were earning. Were it not for grants from the U.S. Federal Government and AIME in 2020 and 2021, we would have had to support operations by drawing down our reserves. By 2022, subsidies were no longer available, so the Society withdrew about \$2 million from reserves to offset deficit operations.

As we exit the pandemic era, leadership is anticipating that we will withdraw another \$500K from reserves in 2023. By 2024, we should again be in the position of contributing to reserves rather than drawing from them.

I'll be candid: Managing deficit operations is psychologically, physiologically, emotionally, and intellectually exhausting. For those of us on staff, we worked through it because that's all part of the job, and we are professionals. Still, there is much more to the TMS workforce than staff. We have more than 1,000 volunteers engaged in myriad activities. They have full-time jobs of their own, yet even during the pandemic, they still gave time, energy, ingenuity, and personal resources to advance TMS. On behalf of the Society, I thank all of you who volunteered so generously and unreservedly, especially during an era when it would have been so easy to take a few years off from extracurriculars. And, let us especially take a moment to thank those volunteers who routinely run not the extra mile but the extra marathon to support the Society: The TMS Board of Directors.

I make a lot of decisions for the Society, but I do this only because I am empowered to do so by the Board. The Board is the ultimate decision-making entity in the Society, and the last three years presented many opportunities for them to overreach, to act out of desperation, to point fingers, to get pouty about the job not being what they signed up for, to grasp at straws, to engage in denialism, or to simply succumb to the pandemic malaise that has had so many people abandon their responsibilities. Our Board kept calm and displayed no such behavior. Instead, they have been thoughtful, reasonable, judicious, patient, open to advice, and ever mindful of their responsibility to steward the Society on behalf of the members. The Board sought to maintain our operations and aspirations for as long as our financial capabilities could be responsibly leveraged to do so. They then accepted that changes to our operations and aspirations would be necessary so we could slow and then stop the draw on the reserves. We are on the path toward doing just that.

I expect that I will see many of you in a few weeks for TMS2023 in San Diego, California. My suggestion: Take a moment to seek out a Board member and thank them for leading the Society through adversity and for positioning us for a return to prosperity. I know that they deserve and have my gratitude.

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James J. Robinson
Executive Director

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"By 2024, we should again be in the position of contributing to reserves rather than drawing from them."

JOM TECHNICAL TOPICS

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This article provides summaries of the technical topics included in the current issue of *JOM*: The Journal. Visit www.tms.org/JOM to log in for access to the individual technical articles on the Springer website.

FEBRUARY 2023

Reprocessing and Recycling of Tailings from Metallurgical Process

Scope: In recent times, extensive research and cross-industry collaborative activities have contributed to the development of economical and sustainable routes to utilize tailings, extractive waste and metallurgy slags as secondary resource. This special topic focuses on advances in reprocessing and recycling of tailings from various metallurgical process such as minerals processing, hydrometallurgical and pyro-metallurgical extraction processes.

Editors: Hong Peng, University of Queensland; Tesfaye Fiseha, Metso Outotec; Hamuyuni Joseph, Metso Outotec; Iloeje Chukwunwike, Argonne National Laboratory; and Alexandra Anderson, Gohper Resource

Sponsors: Recycling and Environmental Technologies Committee, Energy Committee, and Process Technology and Modeling Committee

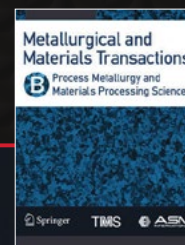
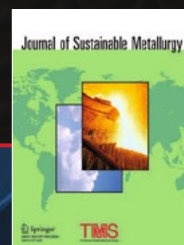
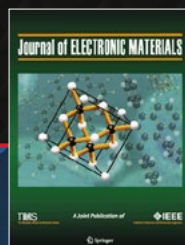
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TMS WELCOMES NEW MEMBERS

The TMS Board of Directors approved professional membership for the following individuals at its October and December 2022 meetings.

Please join us in congratulating and welcoming them to all the privileges and benefits of TMS membership.

Approved October 2022

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Sestito, Jesse, Valparaiso University, United States	Thiagarajan, A., Sri Manakula Vinayagar Engineering Collage, India	Xie, Kelvin, Texas A&M University, United States
Sethuraman, Balaguru, VIT Bhopal University, India	Torres, James, Los Alamos National Laboratory, United States	Xie, Hua, University of Maryland, United States
Shang, Shun-Li, Pennsylvania State University, United States	Trabzon, Levent, Istanbul Technical University, Turkey	Xu, Weinan, United States
Sharma, Bhasham, Wichita State University, United States	Trexler, Morgana, Johns Hopkins University Applied Physics Laboratory, United States	Yalisove, Steven, University of Michigan, United States
Shi, Meng, Idaho National Laboratory, United States	Trumble, Anna, Honeywell Federal Manufacturing and Technologies, LLC, United States	Yepez, Krutskaya, Universidad San Francisco De Quito, Ecuador
Shockley, Darryl, United States Department of Energy, National Energy Technology Laboratory, United States	Ugarte Diaz, Jorge, National University of Engineering, Peru	Yu, Woong-Ryeol, Seoul National University, Korea, South
Siyal, Sajjid, Dawood University of Engineering and Technology, Pakistan	Urbanek, Miroslav, COMTES FHT a.s., Czech Republic	Zbib, Mohamad, Purdue University, United States
Smith, Jesse, Argonne National Laboratory, United States	Vahabzadeh, Sahar, Northern Illinois University, United States	Zhang, Xinchang, Idaho National Laboratory, United States
Smith, Nathan, Pennsylvania State University, United States		Zhao, Shouxun, BASF SE, United States
		Zhao, Xin, Clemson University, United States
		Zhu, Hanyu, Rice University, United States
		Zhukov, Arcady, University of the Basque Country, Spain

PREVIEW THE TMS2023 PROCEEDINGS VOLUMES

Megan Enright



The TMS 2023 Annual Meeting & Exhibition (TMS2023), scheduled for March 19–23, 2023, in San Diego, California, USA, will feature 99 symposia. TMS is set to publish 11 proceedings volumes which will provide a written record of TMS2023's robust programing.

As a benefit of attending, TMS2023 registrants will have free, online access to the meeting's proceedings publications. For those unable to attend, the proceedings volumes, as well as individual papers, can be purchased through the TMS Bookstore portal at www.tms.org/Bookstore. All 11 publications will be available by the start of the meeting.

TMS members receive a 40% discount on TMS proceedings publications and a 20% discount on TMS non-proceedings titles published with Springer. To receive the appropriate discount on the books described in this article, visit www.tms.org/Bookstore, log in to see the discount codes in the text above the product listing, and enter the proceedings discount code during checkout on the Springer website.

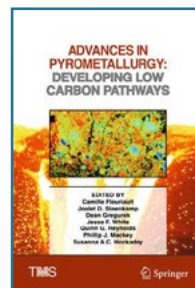
READ ON TO EXPLORE EACH OF THE TMS2023 TITLES.



ADVANCES IN POWDER AND CERAMIC MATERIALS SCIENCE 2023

This collection represents the interdisciplinary studies from the Advances in Powder and Ceramic Materials Science and Powder Materials Processing and

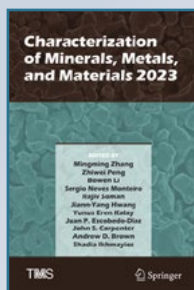
Fundamental Understanding symposia. Contributions focus on the advances of powder and ceramic materials in fundamental research, technology development, and industrial applications. Papers also cover synthesis, characterization, modeling, and simulation of powder and ceramic materials; design and control of ceramic microstructure and properties; ceramic powders and processing; surface treatment and thin films, membranes, and coatings of ceramics; hybrid systems of ceramic, metal, and/or polymer composites; metallurgical byproducts for ceramic manufacturing; and high-entropy ceramics.



ADVANCES IN PYROMETALLURGY: DEVELOPING LOW CARBON PATHWAYS

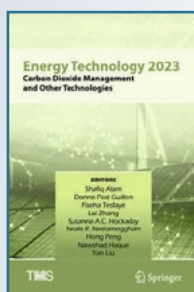
This volume features a collection of work from a new symposium series, Advances in Pyrometallurgy, sponsored by the Extraction

and Processing Division (EPD) and the Pyrometallurgy Committee. This first installment explores the theme Developing Low Carbon Pathways. In this volume, innovative and diverse strategies for the enablement of low carbon industries in the high-temperature metals and materials processing fields are explored. The potential of hydrogen as an alternative reducing agent for ironmaking and alloy smelting is discussed. Assessments of other alternatives to fossil carbon, such as biocarbon, for the reduction of metal oxides but also for the manufacturing of electrodes and refractory are included. Novel energy efficiency and waste heat recovery concepts contributing to a lower footprint of production processes are also covered. The analysis of renewable energies, such as solar power applied toward metallurgical practices, is also included.



CHARACTERIZATION OF MINERALS, METALS, AND MATERIALS 2023

This collection from one of the largest symposia at TMS2023 explores advanced characterization of extraction and processing of minerals; process–microstructure–property relation of metal alloys, ceramics, polymers, and composites; and more. This collection also highlights new characterization methods, techniques, and instrumentations. This symposium is sponsored by the EPD and the Materials Characterization Committee.

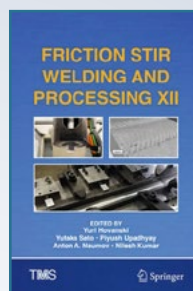


ENERGY TECHNOLOGY 2023: CARBON DIOXIDE MANAGEMENT AND OTHER TECHNOLOGIES

New and efficient energy technologies, including innovative ore beneficiation, smelting technologies, recycling and waste heat recovery, and emerging novel energy solutions, are the focus of this volume. Research and development papers on mature and new technological aspects of sustainable energy ecosystems, materials for energy storage, life cycle assessment of energy systems, energy-efficient technologies in extractive metallurgy are included. This collection also features contributions on processes and devices that improve energy efficiency, reduce thermal emissions, and reduce carbon dioxide and other greenhouse gas emissions. This symposium is sponsored by the Energy Committee, the EPD, and the Light Metals Division (LMD) and features contributions from academia, industry, and government sectors.

VISIT THE TMS BOOKSTORE

In addition to the most current releases presented in this article, TMS also offers convenient, searchable access to more than 300 past titles in its expanded online bookstore. To take advantage of this member benefit, go to www.tms.org/Bookstore and log in to access your **40% discount** code on TMS proceedings. Search by keyword, author, or year, with the option of purchasing individual papers as well as hardcopy and e-book formats. The resources available span TMS's publishing history, including important archival work that was previously difficult to find.



FRICTION STIR WELDING AND PROCESSING XII

This collection features contributions that explore all aspects of friction stir technologies, including friction stir welding (FSW) of high melting temperature materials, FSW of lightweight materials, FSW of dissimilar materials, simulation of friction stir welding and processing (FSWP), controls and inspection of FSWP, and derivative technologies such as friction stir processing, friction stir spot welding, additive friction stir, and friction stir extrusion. Additive friction stir deposition is also highlighted in this collection. This twelfth iteration of this symposium is sponsored by the Shaping and Forming Committee and the Materials Processing and Manufacturing (MPMD) Division.



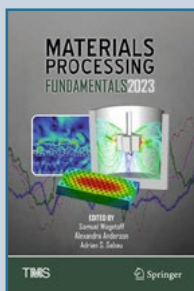
LIGHT METALS 2023

This annual volume is a definitive resource in the aluminum production and related light metal technologies fields. The 2023 collection includes contributions from the following symposia: 60 Years of Taking Aluminum Smelting Research and Development from New Zealand to the World: An LMD Symposium in Honor of Barry J. Welch; Alumina & Bauxite; Aluminum Alloys, Characterization, and Processing; Aluminum Industry Emissions Measurement, Reporting, and Reduction; Aluminum Reduction Technology; Aluminum Waste Management and Utilization; Cast Shop Technology; Electrode Technology for Aluminum Production; and Scandium Extraction and Use in Aluminum Alloys.



MAGNESIUM TECHNOLOGY 2023

This 24th volume in the Magnesium Technology series features papers on topics pertaining to alloy design, fundamentals of plastic deformation, primary production, recycling and ecological issues, characterization, joining, machining, forming, degradation and biomedical applications, corrosion and surface protection, and computational materials engineering. Also covered in this volume are contributions from several distinguished invited speakers from industry, government organizations, and academia who shared their perspectives on the state of the art, goals, and opportunities in magnesium alloy research and development in keynote sessions. This symposium is sponsored by the Magnesium Committee and the LMD.



MATERIALS PROCESSING FUNDAMENTALS 2023

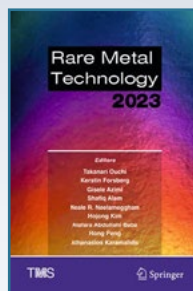
This collection offers interdisciplinary contributions on processing, sensing, modeling, multi-physics, computational fluid dynamics, thermodynamics, and more. Ferrous and non-ferrous elements are among the materials covered as well as the

processes that range from mining unit operations to joining and surface finishing of materials. This collection also includes applications such as steel processing, modeling of steel and non-ferrous alloys treatments for properties control, multi-physics, and computational fluid dynamics modeling for molten metal processes and properties measurement. Also presented are extractive, recovery, and recycling processes. This symposium is sponsored by the Process Technology and Modeling Committee.



NEW DIRECTIONS IN MINERAL PROCESSING, EXTRACTIVE METALLURGY, RECYCLING AND WASTE MINIMIZATION: AN EPD SYMPOSIUM IN HONOR OF PATRICK R. TAYLOR

This volume focuses on contributions to the symposium honoring Patrick R. Taylor, George S. Ansell Endowed Chair Professor of Chemical Metallurgy and Director of the Kroll Institute for Extractive Metallurgy, Colorado School of Mines. Contributions cover new concepts and fundamentals, updates on reactor design and processes, industrial practices and developments, and environmental issues which influence the selection of metallurgical processes. These topics are discussed as they relate to new directions in pyrometallurgy, hydrometallurgy, electrometallurgy, mineral processing, metals and e-waste recycling, waste minimization, and innovations in metallurgical engineering education and curriculum development. This symposium is sponsored by the Society for Mining, Metallurgy & Exploration (SME); the EPD; and the Pyrometallurgy, Hydrometallurgy and Electrometallurgy, Materials Characterization, Energy, and Recycling and Environmental Technologies Committees.



RARE METAL TECHNOLOGY 2023

This collection from the tenth iteration of the Rare Metal Extraction and Processing symposium discusses the extraction process of rare metals from primary and secondary materials and residues as well as processing techniques

used in rare metal production and mineral processing, explore process development, process optimization, product characterization, environmental impacts, and plant engineering. Also covered are various processing techniques for mineral beneficiation, separation, extraction, and purification of rare metals, which are based on biometallurgy, hydrometallurgy, pyrometallurgy, electrometallurgy, and other new extractive metallurgy techniques. This symposium is sponsored by the EPD, the Hydrometallurgy and Electrometallurgy Committee, and the Recycling and Environmental Technologies Committee.



TMS 2023 152ND ANNUAL MEETING & EXHIBITION SUPPLEMENTAL PROCEEDINGS

This collection features contributions that represent 44 symposia from the meeting.

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TMS 2023
 152nd Annual Meeting & Exhibition



Don't miss your chance to attend the live presentations of the contributions to the proceedings volumes featured in this article. In addition to high-quality technical programming, TMS2023 offers professional development events and opportunities to network with colleagues and future collaborators. Registrants will receive free, online access to the meeting's proceeding publications. Register today to attend TMS2023 at www.tms.org/TMS2023.



TMS Members Benefit from the 2022 Emerging Leaders Alliance Conference

Megan Enright

"I'm humbled to be selected as one of the TMS representatives at the 2022 Emerging Leaders Alliance (ELA) conference, which strengthened my non-technical skills to interact across disciplines and obtain foundational, executive-level knowledge. I greatly benefited from this unique leadership development program for early career professionals, and I look forward to opportunities for future leadership roles or upper-level management positions," said Huanyu "Larry" Cheng, Pennsylvania State University, one of seven TMS early career professionals who attended the 2022 ELA conference from September 26-28, 2022, in Pittsburgh, Pennsylvania.

The Emerging Leaders Alliance conference provides interdisciplinary training for future leaders of the science and engineering community. Attending the ELA conference supplies early career professionals with high-quality training in the skills needed to guide the profession and face the needs and challenges of today. TMS is one of eight partner societies supporting the ELA conference. The attendance of TMS members is made possible through the support of the TMS Foundation.

Julien Lauzon-Gauthier, Alcoa, also gained valuable skills from attending. "The ELA conference was a very good opportunity to get hands-on knowledge on a very broad diversity of topics linked to management and leadership. The high level of interactions between the participants and with the presenters added real value to the training," he said. "I liked the different workshops where we tried to apply what we learned, either in small teams or with the full group, and then got instant feedback to adjust and improve."

In accordance with her peers, Nicole Overman, Pacific Northwest National Laboratory, attained worthwhile knowledge from this program. "The ELA program was the perfect setting to network with peers from a variety of institutions and learn what I can personally do to become a more effective communicator and leader. Specifically, the presentation skills session was a highlight. It was amazing to see how quickly people improved with non-technical coaching and feedback on their delivery. I sincerely believe my time spent at the conference was highly valuable and am looking forward to sharing some of these key take-aways with my team," she commented.

Are you interested in enhancing your own leadership skills? TMS is now accepting applications for the next ELA conference, scheduled for September 25–27, 2023. Applicants must be TMS members, typically between ages 24–40, with rising or current leadership positions within their organizations. To apply to attend the 2023 conference, please send a letter of interest, one or two letters of recommendation, and a resume or curriculum vitae to Deborah Hixon, TMS Awards Program Manager, at hixon@tms.org. The deadline to apply for the 2023 conference is **May 15, 2023**.

"I appreciate that the participants at the ELA conference represent a very diverse spectrum of engineering disciplines. This unique program and setting provided an enriching forum for us to network, discuss, share experiences, and learn from each other! I have truly enjoyed every minute of my time at ELA," Wenzhuo Wu, Purdue University, shared.

As noted by the TMS members highlighted in this article, the ELA program provides opportunities to network across disciplines and gain foundational, executive-level knowledge while improving leadership and communication abilities. To support this program and future TMS leaders, consider donating to the TMS Foundation. Any level of contribution helps to ensure that the rising leaders in the materials community have access to this valuable program, in addition to other TMS Foundation opportunities. Visit www.TMSFoundation.org to learn more and make a donation today.



The TMS attendees of the 2022 ELA conference. Front row, left to right: Deborah Hixon, TMS Awards Program Administrator; Julien Lauzon-Gauthier, Alcoa; and Mary Beth Wagner. Middle row, left to right: Wenzhuo Wu, Purdue University; Nicole Overman, Pacific Northwest National Laboratory; and Huanyu "Larry" Cheng, Pennsylvania State University. Back row, left to right: Kyle Johnson, Sandia National Laboratories, and Daniel Bechetti, Naval Surface Warfare Center.

TMS MEETING HEADLINES

Meeting dates and locations are current as of December 8, 2022. For the most recent updates on TMS-sponsored events, visit www.tms.org/Meetings.



TMS 2023 Annual Meeting & Exhibition (TMS2023)

March 19–23, 2023
San Diego,
California, USA

**Housing Deadline:
February 23, 2023**

Come together with your colleagues from the global minerals, metals, and materials community in San Diego, California, for the fully in-person TMS 2023 Annual Meeting & Exhibition (TMS2023), March 19-23, 2023. Register now to join them!

www.tms.org/TMS2023



Superalloy 718 & Derivatives 2023

May 14–17, 2023
Pittsburgh,
Pennsylvania, USA

**Late Breaking News
Submission Deadline:
March 31, 2023**

Superalloy 718 & Derivatives 2023 will explore all aspects of metallurgical processing, materials behavior, and microstructural performance for a distinct class of 718-type superalloy and derivatives.

[www.tms.org/
Superalloy718-2023](http://www.tms.org/Superalloy718-2023)



7th World Congress on Integrated Computational Materials Engineering (ICME 2023)

May 21–25, 2023
Orlando, Florida, USA

**Discount Registration
Deadline:
April 7, 2023**

This is the only congress dedicated to bringing all stakeholders together from across nations, disciplines, and organizations to focus on integration priorities and gaps that need to be addressed in order to advance the field.

www.tms.org/ICME2023



TMS Fall Meeting 2023 @ Materials Science & Technology (MS&T)

October 1-5, 2023
Columbus, Ohio, USA

**Abstract Deadline:
April 3, 2023**

TMS Fall 2023 at MS&T23 is a long-standing, recognized forum for fostering technical innovation at the intersection of materials science, engineering, and application.

[www.tms.org/
FallMeeting/
TMSFall2023](http://www.tms.org/FallMeeting/TMSFall2023)

Other Meetings of Note



3rd World Congress on High Entropy Alloys (HEA 2023)

November 12-15, 2023
Pittsburgh, Pennsylvania,
USA

www.tms.org/HEA2023



TMS 2024 Annual Meeting & Exhibition (TMS2024)

March 3–7, 2024
Orlando, Florida,
USA

www.tms.org/TMS2024



15th International Symposium on Superalloys (Superalloys 2024)

September 8–12, 2024
Champion, Pennsylvania,
USA

[www.tms.org/
Superalloys2024](http://www.tms.org/Superalloys2024)



TMS 2025 Annual Meeting & Exhibition (TMS2025)

March 23–27, 2025
Las Vegas, Nevada,
USA

www.tms.org/TMS2025

**Offshore Technology
Conference (OTC) 2023**
May 1-4, 2023
Houston, Texas, USA
Co-sponsored by TMS

**European Metallurgical
Conference (EMC 2023)**
June 11-14, 2023
Düsseldorf, Germany
Co-sponsored by TMS

**OTC Brasil
2023**
October 24–26, 2023
Rio de Janeiro, Brazil
Co-sponsored by TMS

**Materials in Nuclear Energy
Systems (MiNES 2023)**
December 10–14, 2023
New Orleans, Louisiana, USA
Co-sponsored by TMS

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October 1-5, 2023 | Columbus, Ohio | #TMSFallMeeting

CALL FOR ABSTRACTS

Abstracts Due April 3, 2023

Join your TMS colleagues for the TMS Fall Meeting 2023 at Materials Science & Technology (TMS Fall 2023) in October.

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- Artificial Intelligence
- Ceramic and Glass Materials
- Education and Career Development
- Fundamentals and Characterization
- Iron and Steel (Ferrous Alloys)
- Lightweight Alloys
- Modeling
- Nuclear Energy
- Processing and Manufacturing
- Special Topics



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www.tms.org/TMSFall2023

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TMS 2023

152nd Annual Meeting & Exhibition



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WHY TMS2023

"TMS is a very meaningful conference for two types of people:
1) Full-fledged academicians trying to learn and solve for 'Whys'
and 2) Industry people who have to create large workflows with
known pieces of technology implemented in innovative ways."

—Deepankar Pal,
Senior Principal, Ansys Inc.



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March 19-23 • Meeting Dates

March 20-22 • Exhibit Dates

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