JOM

FEBRUARY 2021
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An official publication of The Minerals, Metals & Materials Society

CELEBRATING EXCELLENCE: Meet the 2021 TMS Award Recipients

TMS Springer

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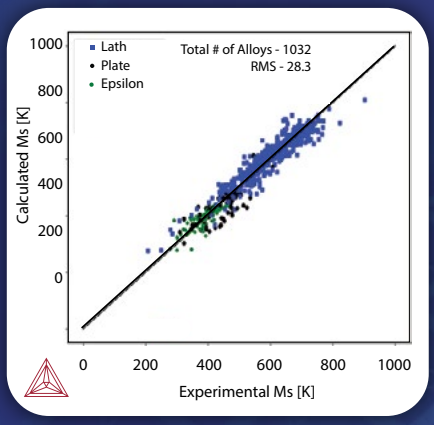
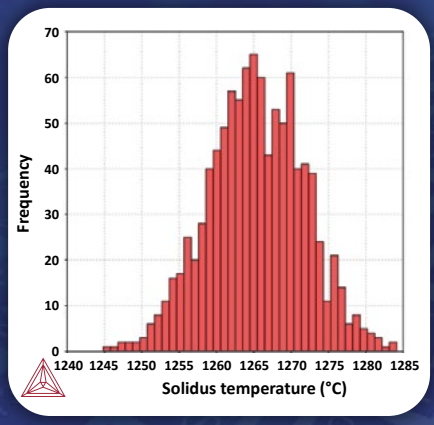


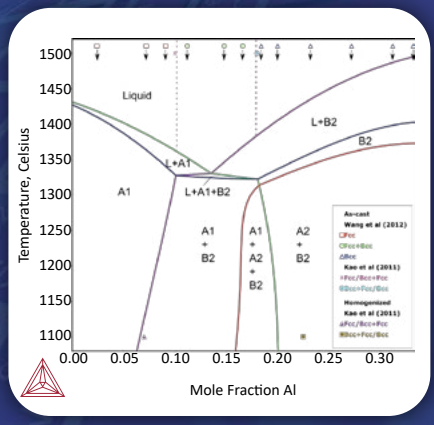
Comparison of calculated and experimental Ms temperatures for a wide range of steels

Nickel



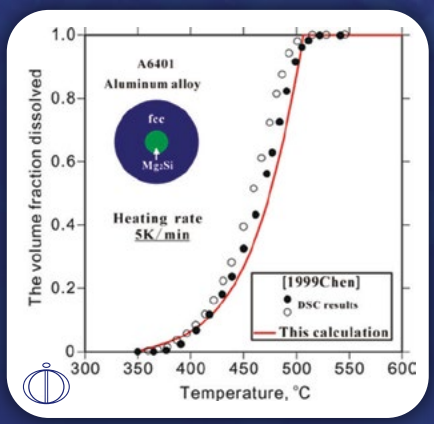
Variation in solidus temperature over 1000 compositions within alloy 718 specification

High Entropy Alloys



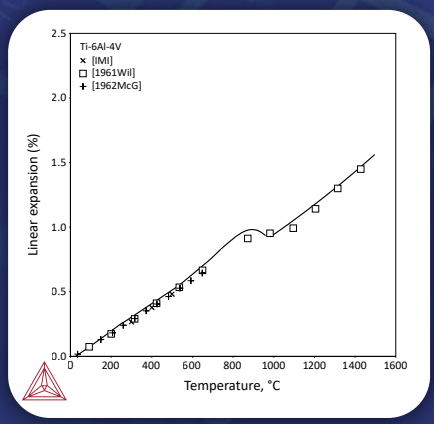
Calculated phase diagram along the composition line of CoCrFeNi-Al

Al Alloys



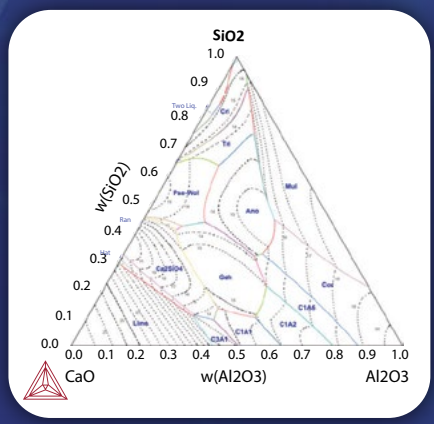
Dissolution of Mg2Si precipitate in Alloy A6401

Ti and TiAl Alloys



Linear expansion vs Temperature for Ti-6Al-4V

Oxides



Ternary liquidus projection in oxide systems

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About the Cover

Corrosion has been a great concern in the oil and natural gas industry because it adversely affects the infrastructure in exploration, production, processing, and transport of oil and natural gas, such as in the liquid natural gas plant shown on the cover. The article "Fe Thin Film Coated Optics for Corrosion Monitoring: Optical and Electrochemical Studies," by Ruishu Wright et al., investigates corrosion proxy materials integrated with an optical sensing platform that enable a real-time optical corrosion sensor for natural gas pipelines to prevent methane leaks and catastrophic events.

February 2021 Guest Editors

Advanced Coating and Thin Film Materials for Energy, Aerospace and Biological Applications
Surface Engineering Committee; Thin Films and Interfaces Committee
Jing Zhang, Purdue University
Yeon-Gil Jung, Changwon National University
Albert Feuerstein, Retired, Praxair
Li Li, Rolls Royce
Raymond Sinatra, Consultant

Materials for High Reliability Devices
Electronic Packaging and Interconnection Materials Committee
Albert T. Wu, National Central University
Babak Arfaei, Binghamton University

Recent Advances in Functional Materials and 2D/3D Processing for Sensors and Electronic Applications
Thin Films and Interfaces Committee
Pooran Joshi, Oak Ridge National Laboratory
Nuggehalli Ravindra, New Jersey Institute of Technology
Sufian Abedrabbo, Khalifa University

Thermodynamic Optimization of Critical Metals Processing and Recovery
Process Technology and Modeling Committee; Recycling and Environmental Technologies Committee
Chukwunwike Iloeje, Argonne National Laboratory
Fiseha Tesfaye, Abo Akademi University
Alexandra Anderson, Gopher Resource

About JOM:

The scope of *JOM* (ISSN 1047-4838) encompasses publicizing news about TMS and its members and stakeholder communities while publishing meaningful 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:

The Minerals, Metals & Materials Society (TMS) is a professional organization that encompasses the entire range of materials and engineering, from minerals processing and primary metals production to basic research and the advanced applications of materials.

Publishing Information:

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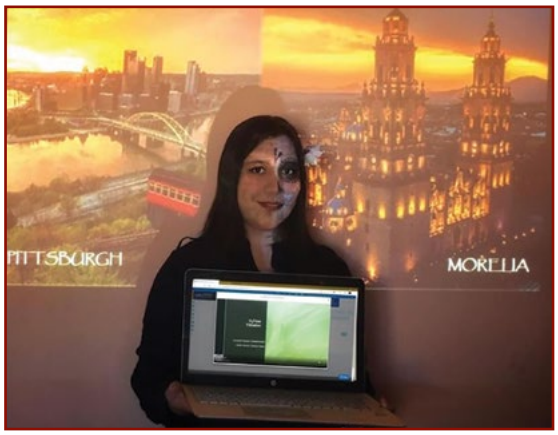
JOM: THE MAGAZINE



JOM: THE JOURNAL

Advanced Coating and Thin Film Materials for Energy, Aerospace and Biological Applications

Materials for High Reliability Devices

Recent Advances in Functional Materials and 2D/3D Processing for Sensors and Electronic Applications

Thermodynamic Optimization of Critical Metals Processing and Recovery

Technical Articles

SUBMIT AN ABSTRACT FOR

Technical Meeting and Exhibition

MS&T21

MATERIALS SCIENCE & TECHNOLOGY

BEFORE MARCH 15, 2021

MATSCITECH.ORG/MST2021

OCTOBER 17 – 21, 2021
COLUMBUS OH

Organizers:

The American Ceramic Society
www.ceramics.org

AIST
ASSOCIATION FOR IRON & STEEL TECHNOLOGY

TMS
The Minerals, Metals & Materials Society

WHERE MATERIALS INNOVATION HAPPENS

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https://doi.org/10.1007/s11837-020-04536-3

in the final analysis

JOM
Volume 73
Number 2
February 2021

"If plan A fails, remember there are 25 more letters."
—Chris Guillebeau

In the Coronavirus era, I admit that TMS has had a lot of Plan A fails. Ditto many Plan Bs, Cs, Ds, . . . and Zs, right into the Greek alphabet like the Atlantic hurricane season. Adjust though we did, the tendrils of COVID-19 impacted every aspect of TMS operations and business initiatives in a generally negative fashion, suffocating events, publications, membership, strategic initiatives, grant acquisitions, volunteer engagement, advocacy, and . . . you get the idea. Financially, the year would have ended with an operating deficit were it not for a record TMS2020 immediately prior to the Coronavirus explosion and the opportunism of the Society to apply for and receive a sizeable but forgivable loan from the U.S. Government.

Today, we are in the upswing of widespread vaccine distribution and the shape of normality is on the not-too-distant horizon. We are not there yet, but COVID-19 seems likely to diminish before we reach 2022—but *when* and by *how much*? To develop a 2021 budget, we needed crystal balls, not spreadsheets. Lacking the former, we built the 2021 budget predicated on "normalcy" returning by mid-year. Of course, normalcy in this context does not mean back to normal. We need time to recover physically, emotionally, and psychologically; to become comfortable with interacting and traveling again; to re-engage on work that may have been slowed or paused since March last year; and to re-adopt to the routine of getting proper haircuts.

During my service as Executive Director, I had never submitted a net negative budget for approval by the volunteer leadership. I can't say that anymore. Operations are budgeted to come up about $600K short in 2021. Red ink notwithstanding, I'm proud of our collective work. What TMS has experienced, and continues to experience, is much more a function of a "black swan" event than poor business practices. We can recover. We will recover.

For context, our pre-Coronavirus revenue expectation for 2020 was $9.2M. Throw COVID-19 into the mix, and our 2020 revenue will be about $7.7M. For 2021, as the pandemic continues, we are budgeting $6.3M in revenue. Then the corner is turned: For 2022, we project revenue to rebound to $8.3M; by 2023, we should be back to $9M.

How do we sustain ourselves until the rebound? Well, we are cutting expenses. That's a given. We are doing this with prudence. I know that many of you are concerned for the TMS staff; be assured that they are all retained in the 2021 budget. We need their talent, experience, and expertise now more than ever. We are also investing to more fully engage our volunteers and members through virtual tools and experiences. We expect the "Zoom" culture to only grow and that presents an opportunity for us to grow with it. Most importantly, TMS is a beneficiary of a financial vision engineered by volunteer and staff leadership over the decades—an operating reserve built by accumulating annual surpluses from operations, revenue from the sale of the TMS headquarters building, and income from investments. By TMS policy, the reserve is, in part, "to help ensure the long-term stability of TMS and to provide funds for use against severe economic conditions and other unanticipated events." As of the end of 2020, we project about $4.5M of unrestricted assets to reside in these reserves. We have the headspace to endure a bad year.

Will our Plan A work? Candidly, I'm optimistic that we will outperform our expectations. You can help by renewing your membership, recruiting a colleague to join or volunteer, registering for TMS2021 or MS&T21 or a specialty meeting, taking a short course, publishing a paper in a TMS journal, . . . any form of engagement lifts the Society, benefits your career, and enhances the materials science and engineering community. That's a "win-win-win."

If Plan A doesn't work, I'm prepared through Plan Iota. After that, I'm open to suggestions!

James J. Robinson
Executive Director
@JJRofTMS

"What TMS has experienced, and continues to experience, is much more a function of a 'black swan' event than poor business practices. We can recover. We will recover."

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https://doi.org/10.1007/s11837-020-04537-2

TMS Members Selected for Presidential Subcommittee; Explore the Redesigned TMS Webinar Library

Presidential Council Selects Two TMS Members for New Subcommittee

Kiyo Fujimoto

TMS members Kiyo Fujimoto and Emily Rinko have been nominated and accepted appointments to the Students, Post-Doctoral, and Early Career (SPEC) Subcommittee of the President's Council of Advisors on Science and Technology (PCAST) in late 2020. The newly created SPEC Subcommittee includes 10 members to participate in developing reports and informing science policy for PCAST, offer feedback on PCAST recommendations, and provide input on improving the STEM education experience. Established in 2011, PCAST "makes policy recommendations in the many areas where understanding of science, technology, and innovation is key to strengthening our economy and forming policy that works for the American people," according to the U.S. Office of Science and Technology Policy.

Fujimoto is pursuing her Ph.D. in materials science and engineering at Boise State University (BSU) and working as a graduate fellow at Idaho National Laboratory. "It is exciting to know that my experiences and input can be utilized to potentially improve the STEM experience for current and future generations of scientists and engineers," Fujimoto said in a BSU announcement. Her current research focuses on 3D printing for the development and fabrication of advanced nuclear instrumentation and sensors. She has been a TMS member since 2020.

"I want to help create a positive and supportive environment for future scientists," said Rinko, noting her excitement at accepting the position in an announcement from Ames Laboratory. Rinko is currently a Ph.D. candidate at Iowa State University studying materials science and engineering, specifically focusing on AlNiCo magnets. She also works as a graduate research assistant at Ames Laboratory. As a TMS member since 2018, Rinko is involved in the Public & Governmental Affairs Committee and Powder Materials Committee.

Emily Rinko
(Photo credit: Ames Laboratory)

correction

JOM staff apologizes for the misspelling of T.M. Kelsy Green's name in the January 2020 article, "Showcasing the 2021 TMS Scholars." Green is the recipient of the 2021 TMS International Symposium on Superalloys Scholarship.

member news

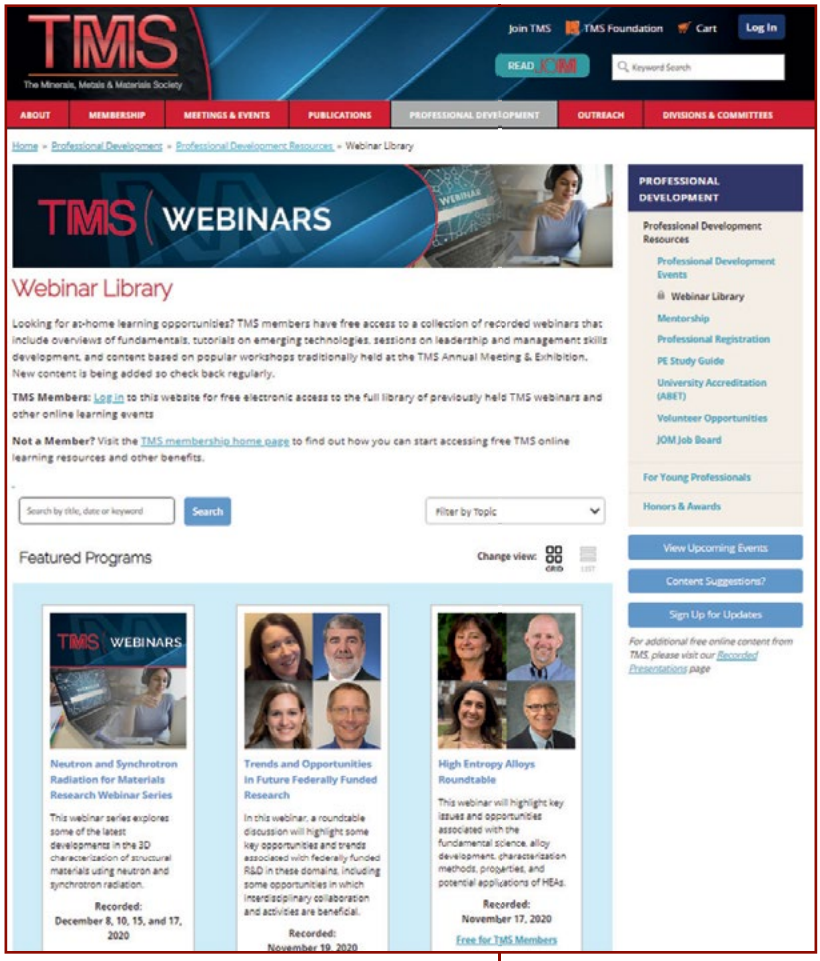
Share the good news about your professional accomplishments! Contact Kaitlin Calva, JOM Magazine Managing Editor, at kcalva@tms.org. Please note that only news submitted by current TMS members will be considered.

See What's New in the TMS Webinar Library

The newly redesigned TMS Webinar Library features a variety of topics, from fundamentals and emerging technologies, to developing business and leadership skills, to recent advancements and current issues impacting the breadth of materials science and engineering. The library includes 12 new programs recorded in 2020 alone, with new content in development for 2021 at press time, as well as access to webinars recorded in 2018 and earlier. Enhancements to the resource include the ability to search for webinars by keyword, presenter, or event title, and to view past webinar recordings directly through the TMS website.

As an exclusive benefit, TMS members can access live or recorded events for free. Members can log in at www.tms.org/WebinarLibrary to access webinar content.

If another topic would fit your interests and needs, TMS is accepting ideas for new webinars. Simply click the "What New Content Do You Need?" button on any webinar page to provide suggestions for new programs through our Online Learning Resources Survey.



Updated Impact Factor for *JOM*

In October 2020, the 2019 Impact Factor for *JOM* was adjusted from 2.029 to **2.054**. The update came after a small number of articles were moved to the appropriate indexing category. For more details on the Impact Factors for all TMS journals, read the September 2020 *JOM* article, "Impact Factors and Other Key Metrics Released for All Six TMS Journals."

Announcing the 2021 TMS Meeting of the Membership and Open Board of Directors Meeting

The Minerals, Metals & Materials Society, Inc., in accordance with its bylaws (Article II, Section 2.6, and Article III, Section 3.7) will hold the 2021 Annual Meeting of the Membership with Open Board of Directors Meeting in conjunction with TMS2021 Virtual, on Thursday, March 18, 2021, from 11:00 a.m. to noon (ET), via GoToWebinar.

Registration is required by March 11. Attendance is limited. All TMS members are welcome to attend, and valid TMS membership is required. The event is free, and TMS2021 Virtual registration is not required.

To register visit www.tms.org/2021TMSMeetingOfTheMembership. The meeting will be recorded with the intent to post it to the TMS web site.

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JOM themagazine

In Case You Missed It:

Business News from the Field

Do you have business or industry news of interest to the minerals, metals, and materials community? Submit your announcement or press release to Kaitlin Calva, JOM Magazine Managing Editor, at kcalva@tms.org for consideration.

Profits Jump for MP Materials

Las Vegas, Nevada, USA: MP Materials Corp., owner of the only U.S. rare earths mine located in Mountain Pass, California, reported a fivefold increase in its third-quarter profit, just days after the company went public on the New York Stock Exchange. The Mountain Pass facility contains more than 800 kilotons (880,000 short tons) of recoverable rare earth oxides with an average 8% ore grade, one of the highest-quality known deposits in the world. In late 2020, the U.S. federal government awarded $9.6 million to MP Materials to help boost domestic production of the specialized minerals used in broad applications, from weapons to wind turbines and satellites.

Mercedes-Benz Adopts Sustainable Cobalt Practices

Stuttgart, Germany: Mercedes-Benz AG is committing to only source battery cells for its electric vehicle fleet with cobalt and lithium from certified mining sites, while also seeking to significantly reduce its cobalt use. The automaker's partners must commit to working within their own supply chain to source exclusively from raw material suppliers that are audited in accordance with the Initiative for Responsible Mining Assurance (IRMA) mining standard. In the next-generation battery cells, Mercedes-Benz plans to reduce the cobalt content to less than 10% and intends to dispense with materials such as cobalt entirely through post-lithium-ion technologies with new material compositions.

Jaguar Land Rover Tests Advanced Metals

Whitley, U.K.: Jaguar Land Rover is participating in scientific trials to test the capability of advanced lightweight metals and composites to be used in future vehicles. The company will use sensors developed for the aerospace industry to understand how materials respond to corrosive environments, in global markets and over rigorous terrains. The research is affiliated with Gesamtverband der Aluminiumindustrie (GDA), a consortium of aluminum manufacturers and carmakers researching the longevity of materials and how they can be made lighter and more durable.

LKAB Makes Carbon-Neutral Shift

Luleå, Sweden: Luossavaara-Kiirunavaara Aktiebolag (LKAB), a Swedish iron ore mining company, announced a transformational plan to replace pellet production with hydrogen-reduced sponge iron, in step with the European steel industry's transition to a carbon-neutral future. The plan calls for significant annual investments over the coming years, about SEK 10 billion to 20 billion (US$1.2 billion to US$2.3 billion) annually over the next 20 years. By positioning the company to offer carbon-free products for the vehicles and industrial machinery of the future, LKAB expects to more than double annual sales up until 2045.

Edinburgh, U.K.: Research on the International Space Station (ISS) showed that the bacterium Sphingomonas desiccabilis was able to extract 14 different rare earth elements from basalt under microgravity conditions as efficiently as on Earth. Astronauts added the bacterium and basalt in miniature reactors under microgravity conditions and in specially designed incubators that contain centrifuges capable of simulating gravity on Mars and Earth. The experiments provide evidence that future dwellers of the moon or Mars could use biomining to access rare earth elements that might be needed to build and repair equipment. (Photo credit: European Space Agency.)

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HONORING THE 2021 TMS AWARD RECIPIENTS

MEGAN ENRIGHT

The awards conferred by TMS have a crucial role in acknowledging the hard work, dedication, and success of members of the minerals, metals, and materials community. These honors span the full gambit of career stages by recognizing everything from outstanding lifetime contributions to the field to those whose careers are just getting started. Recipients gain well-deserved recognition and aid in the advancement of the entire community by helping to grow careers, providing opportunities to share knowledge, and inspiring others to continue to reach for new heights.

This article highlights the Society-level awards which will be conferred during the TMS–AIME Awards Ceremony at the TMS 2021 Annual Meeting & Exhibition (TMS2021). All annual meeting registrants are invited to attend this distinguished ceremony to support the 2021 honorees. Most division-level awards will be presented during recognition programs scheduled throughout TMS2021, many of which are also open to all attendees. Visit www.tms.org/TMS2021 for additional information.

Nominate for TMS Awards by April 1

Do you have a colleague who has made a significant impact on their field? Have they been of great service to their community or to TMS? Honor their contributions and recognize their work by nominating them for a 2022 TMS award.

The nomination deadline for most 2022 TMS awards is April 1, 2021.

Visit awards.tms.org to explore the many honors and awards available through TMS and to learn more about the nomination process. For additional information, contact Deborah Hixon, TMS Awards Program Administrator, at hixon@tms.org.

SOCIETY AWARDS

2021 TMS FELLOWS

The class of Fellow is TMS's highest honor. To be inducted, a candidate must be recognized as the leading authority and contributor to the practice of metallurgy, materials science, and technology, with strong consideration given for outstanding service to the Society.

Dipankar Banerjee

Professor, Indian Institute of Science

Citation: *For seminal contributions to the understanding of titanium and intermetallic alloys and for distinguished international leadership.*

"I am deeply honored by this award from TMS. It represents an international outreach of TMS that we recognize as one of its significant strengths as a Society. TMS meetings, which I attend quite regularly, are a wonderful melting pot and opportunity to meet and interact with a truly international community of materials scientists. At a more personal level, I have been privileged to have been mentored by many in my early career and continue to collaborate in more recent years with many in the United States. This award is also a recognition of the work I have been fortunate to do through these interactions."

Raymond Decker

President, NanoMag LLC

Citation: *For pioneering the invention, seminal development, and commercialization of maraging steels, superalloys, thixomolding, and bioresorbable magnesium implants.*

"I have benefitted from 70 years of membership in TMS, having joined as a student member in 1950. At that time the relationship of properties to processing and microstructure was primitive compared to today. For example, dislocations were not mentioned in any of my undergraduate lectures or textbooks. Since then, TMS has been my learning machine to gain a working knowledge of dislocations and strengthening mechanisms in alloys—for use in inventing Ni-based superalloys, maraging steels, thixomolding and bioabsorbable Mg implants. It is extra special to receive this award from a Society that contributed so much to my results."

David DeYoung

Retired, Alcoa

Citation: *For technical and scientific leadership within Alcoa and to the broader aluminum technical community. For service to TMS and our professional community.*

"Throughout my career, TMS has provided tremendous learning opportunities and these have always exceeded my expectations. Each involvement as a volunteer has invariably turned out to be another development experience. It is truly an honor to be elected a TMS Fellow, and I am humbled to have been considered and selected by colleagues in our field."

Fiona Doyle

Professor, University of California, Berkeley

Citation: *For seminal contributions in the practice of innovative hydrometallurgical processing and technologies including materials extraction, purification, environmentally benign processing and remediation, synthesis, and fundamental modeling.*

"TMS has been vital to my professional success, both as a source of cutting-edge technical material, and as a professional community where I found friends and mentors and learned indispensable skills. I have always felt welcome and valued—something for which many female engineers of my generation had to struggle. The list of living and deceased TMS Fellows is a who's who of intellectual giants whose contributions have transformed the broad field of materials science and engineering. I feel truly humbled and indescribably honored to be joining their ranks."

Somnath Ghosh

Michael G. Callas Chair Professor, Johns Hopkins University

Citation: *For outstanding visionary contributions to the fields of multiscale materials modeling including ICME, and for sustained ambassadorship of materials engineering across various technical communities.*

"I am truly humbled by my selection to the rank of TMS Fellow. I consider this to be one of the highest honors in my professional career. TMS is one of the best professional societies that I have been associated with in my academic career. It has given me the opportunity to interact with some of the best minds in the materials field, who have inspired me with their vision and vibrant intellectual contributions. With this award, I feel lucky to join a distinguished group of colleagues and hope to contribute strongly to the mission of TMS in the coming years."

Hani Henein

Professor, University of Alberta

Citation: *For pioneering developments in pipe-line steels, spray forming, and determination of liquid metal properties; and an outstanding record of publications, international awards, and participation in professional society affairs.*

"As a young member, I admired the TMS Fellows as a group of materials science and engineers (MSE) professionals that are the elite of our profession and represent the epitome of excellence in our community. I was amazed at the many MSE theories and principles that were named after them. Never had I thought that one day I would be joining their ranks as a TMS Fellow. I hope my induction as a TMS Fellow inspires today's young TMS members to excel, contribute to the science, engineering, and service of our profession. Such an achievement, although it is identified with one person, represents the efforts of a community over the years to whom I owe a great gratitude. This gratitude extends to TMS, my international professional home, and numerous friends that have enabled my many achievements."

Donald Sadoway

Professor, Massachusetts Institute of Technology

Citation: *For innovation in electrolytic processing for metals extraction, and for advocacy in resource stewardship, and leadership in materials education.*

"I am thrilled to be awarded the distinction of TMS Fellow. For over 40 years I have benefitted from TMS membership through the rich professional interactions at TMS conferences. No question that this helped shape my career, for which I am truly grateful."

Julie Schoenung

Professor, University of California, Irvine

Citation: *For pioneering contributions to the science and engineering of trimodal composites, and for novel applications of green engineering.*

"I am very honored and humbled to have been selected as a TMS Fellow. I am very proud to receive this recognition from the TMS community and its leadership, and I hope that my inclusion in the 2021 Class of Fellows will serve as a role model for young women in the materials science and engineering community, and to all scholars who follow a non-traditional path through their career and profession. I want to thank those who prepared and supported my nomination, and furthermore, I want to share my deepest gratitude to all of my graduate students, postdoctoral fellows, undergraduate students, staff, collaborators, and my own role models—without their hard work, commitment, support, and friendship along the way, my achievements leading to this honor would not have been possible."

2021 BRIMACOMBE MEDALISTS

This mid-career award recognizes individuals with sustained excellence and achievement in business, technology, education, public policy, or science related to minerals, metals, or materials science and engineering, and a record of continuing service to the profession.

Jamie Kruzic

Professor and Deputy Head of the School of Mechanical & Manufacturing Engineering, University of New South Wales

Citation: *For outstanding contributions to understanding the mechanics and damage tolerance of materials, commitment to professional service and academic leadership, and continued service to TMS.*

"I'm very excited and honored to be a TMS Brimacombe Medalist. TMS has supported every step of my career, including a student travel grant and a young leaders award, and has provided me with a professional community to build lifelong collaborations and friendships. It has been a pleasure to volunteer my time to TMS committees, conferences, and journals, and it is humbling to receive this recognition for my research achievements. I look forward to getting involved with TMS in new ways and having a dynamic future together."

Lei Lu

Professor, Institute of Metal Research, Chinese Academy of Sciences

Citation: *For her significant contribution in metallic materials science, from discovery of high-strength, high-conductivity nanotwinned metals to breakthrough in understanding history-independent cyclic response.*

"I feel privileged and very much honored to receive this prestigious TMS award. This will stimulate me further, in my research and also in my activities in the scientific community."

Michele Manuel

Professor, University of Florida

Citation: *For significant contributions in the integration of systems-based materials design approaches to light metals and her meaningful service to the profession.*

"It is truly an honor to be selected for the Brimacombe Medal Award. Working alongside with distinguished and esteemed TMS colleagues to impact technology, science, engineering, and society at all levels has been a truly enriching and impactful experience, one which has helped me to grow and learn in tremendous and beautifully unpredictable ways. I am thankful for my mentors, colleagues, friends, and especially my family who have continuously supported my career endeavors. I greatly look forward to continuing my professional growth and excellence in the field while maintaining distinguished service to TMS and the profession"

Suveen Mathaudhu

Assistant Professor, University of California, Riverside

Citation: *For exemplary contributions to the science of nanocrystalline materials, education of the public on the impact of materials, and service to the profession.*

"I can simplify my feelings on being recognized as a Brimacombe Medalist with one word: gratitude. I'm grateful to the many mentors, colleagues, students, and friends who have motivated me and who have and will continue to be part my journey. And while mere thankfulness can be expressed in words, gratitude is manifested in actions. The energy and significance of this award will fuel me to continue to show my gratitude to our community and its diverse membership for the remainder of my career."

Federico Rosei

Professor & Director, INRS Centre for Energy, Materials and Telecommunications

Citation: *For outstanding research in structure/property relationships of multifunctional materials and for uncommon dedication to service.*

"I am honored to receive the 2021 TMS Brimacombe Medal. I am very lucky to be recognized for what I consider sheer pleasure, namely playing with atomic and molecular building blocks and linking their structures with their properties. I owe this success to many people who worked with me or supported me and wish to share it with them, at least in spirit."

Mitra Taheri

Professor, Johns Hopkins University

Citation: *For pioneering contributions to in-situ microscopic and spectroscopic characterization, and her commitment to diversity in mentorship of the next generation.*

"TMS was the first society I joined as a student. Since the first TMS meeting that I attended, I have had the opportunity to attend many meetings through various societies and groups; it is TMS, however, that has always felt like 'home' to me. Because of this I'm especially grateful to receive this honor and it's a testament to a Society that not only welcomes members at all levels, but also maintains those relationships over time. I thank my colleagues and friends and look forward to continued engagement within our community."

Guihua Yu

Mike Walker Associate Professor, University of Texas at Austin

Citation: *For innovations in developing new multifunctional nanostructured materials for significant applications in advanced energy, sustainability, and environmental technologies, and dedicated services to materials community.*

"The TMS community is truly special to me, as TMS meetings and activities provide many unique opportunities for researchers working in materials science and engineering to get connected with fellow scientists and engineers in both industry and academia and work together across disciplines to make significant advancement in the materials world to benefit the Society. I look forward to continuing active engagement and contributions to TMS and the broader materials community."

ALEXANDER SCOTT DISTINGUISHED SERVICE AWARD

Recognizing outstanding contributions to TMS, this award is typically presented for 10 or more years of TMS service in membership development, student chapters, education, and professional affairs, and/or other Society-level activity.

Stanley Howard

Professor Emeritus, South Dakota School of Mines and Technology

Citation: *For passionate, dedicated, exemplary uninterrupted and loyal service to The Minerals, Metals & Materials Society since 1966.*

"As a youth, I dreamed of visiting with a metallurgist to learn more of the subject I loved. So, later being able to be a part of and serving

a Society of metallurgists and materials and mineral engineers has been a joy. My friends are here at TMS: dear friends who have enriched my journey of exploration and learning. Having never sought positions or honors, I am surprised by the unlikely circumstance that they have somehow found me, but I attribute it entirely to either the kind encouragement, opportunities, or errors of my dear TMS friends. I am honored to be the 2021 face of service to TMS knowing well there are many who serve or have served devotedly and astutely including my friend and the award's namesake, Alex Scott. Lastly and most importantly, were it not for a previous recipient of this award, my former graduate advisor, colleague, and dear friend, I would never have embarked on my TMS odyssey; thank you, John Hager."

JULIA AND JOHANNES WEERTMAN EDUCATOR AWARD

This award recognizes an individual who has made outstanding contributions to education in metallurgical engineering and/or materials science and engineering.

Katsuyo Thornton
L.H. and F.E. Van Vlack Professor of Materials Science & Engineering, University of Michigan
Citation: *For her dedication to incorporating computational materials science into undergraduate curriculums by leading the development and implementation of the Integrated Computational Materials Education Workshop.*

"It is an incredible honor to receive this award, named after two wonderful, pioneering materials scientists whose legacy continues to live in the materials science community. TMS has been my professional home since I began materials research. It is where I have found a welcoming community that inspires and fosters new, exciting ideas. I am grateful to be part of TMS, where I have benefitted from its culture of inclusion."

LEADERSHIP AWARD

This award recognizes an individual who has demonstrated outstanding leadership in the national and international materials community.

Marc Meyers
Distinguished Professor of Materials Science, University of California, San Diego
Citation: *For outstanding leadership in mechanical behavior of materials, extraordinary creativity, and teaching and mentoring of a large group of students from around the world.*

RESEARCH TO INDUSTRIAL PRACTICE AWARD

This award recognizes an individual who has demonstrated outstanding achievement in transferring research results or findings into commercial production and practical use.

Kazuhiro Nogita
Associate Professor and Director, University of Queensland
Citation: *For establishing the multiple effects of Ni in Pb-free solder alloys, opening the way for a new generation of high-reliability, thermodynamically stable interconnects.*

"I am humbled to be receiving this award. I must acknowledge all of those who have contributed to the work of our Centre over recent years for Pb-free solder and electronic packaging research. Having such great industry support as well as being part of the TMS community and benefiting from communication with other excellent researchers has made my research possible and enjoyable. Over the past 20 years I have learned a lot from this community and the TMS annual meeting continues to be a highlight of my year."

BRUCE CHALMERS AWARD

Honors outstanding contributions to the science and/or technology of materials processing by an individual.

Alan Luo
Professor & Director, The Ohio State University
Citation: *For his outstanding contributions to light metal processing, alloy development, and automotive applications.*

"I am greatly honored to receive this prestigious award and deeply humbled to be associated with its namesake, a pioneer in solidification science, and to join my esteemed colleagues of past awardees. This award recognizes my research in light metals casting and forming, alloy development, and automotive applications. I am grateful for the tremendous support and contributions from my industrial collaborators, university colleagues, and many students and postdocs. I also thank TMS for providing excellent technical meetings and networking opportunities for my research and career development."

CYRIL STANLEY SMITH AWARD

This award recognizes outstanding contributions to the science and/or technology of materials structure.

Amit Misra
Professor, University of Michigan
Citation: *For seminal contributions to the fundamental understanding of defects, interfaces, and nanomechanical behavior in nanolayered and multiphase metallic materials.*

"I feel privileged to have been a TMS member throughout my career in the United States spanning three decades. The opportunities provided by TMS have been significant in my professional development, particularly in fundamental research in structural materials. I feel honored to be recognized with the Cyril Stanley Smith Award and am grateful to the support from my colleagues, friends, and family."

OLEG D. SHERBY AWARD

This award recognizes an individual, or small group of collaborators, who has made significant contributions to the understanding of the behavior of materials at high temperatures.

Jeffery Gibeling
Professor, University of California, Davis
Citation: *For creating innovative methods to acquire mechanical property data with significant impact on understanding mechanisms of high temperature creep deformation in metals and alloys.*

"I am deeply honored to be named the recipient of the 2021 Oleg D. Sherby Award. This award is especially meaningful to me because I knew Oleg Sherby well and learned much from him about high-temperature deformation. His ideas and teaching have had a significant impact on my work in this field, for which I am forever grateful. Oleg Sherby was a warm person with great enthusiasm for materials science and engineering. I especially appreciated his broad perspective on creep deformation as he strove to understand and integrate 'all the data in the world,' as he was fond of saying. One of my favorite presentations was the one I gave at the 2000 TMS Annual Meeting at a symposium honoring Sherby in which I incorporated many concepts I learned from him. Finally, I want to express my appreciation to my nominators and the selection committee for this honor."

WILLIAM HUME-ROTHERY AWARD

Awarded in recognition of exceptional scholarly contributions to the science of alloys.

Ji-Cheng (JC) Zhao
Minta Martin Professor and Department Chair, University of Maryland
Citation: *For development of groundbreaking methodologies for systematic measurements of phase-based properties for the understanding of a very large number of alloy systems.*

Presentation Title: "High-Throughput Measurements of Composition-Dependent Properties of Alloy Phases for Accelerated Alloy Design"

INSTITUTE OF METALS LECTURER & ROBERT FRANKLIN MEHL AWARD

In receiving this pinnacle award, honorees present a lecture at the TMS annual meeting, which is also published in one of the *Metallurgical and Materials Transactions* journals. Named in honor of Robert Franklin Mehl, an instrumental force in the fields of metallurgy and materials science and engineering, the award celebrates 100 years in 2021.

Tresa Pollock
Professor, University of California, Santa Barbara
Citation: *For extraordinary contributions to the improved understanding of high-temperature alloys and coatings. For being an inspirational role model for young engineers of both genders.*

"I am deeply honored to be selected to receive this award. It is a heartfelt recognition of my collaborators and my students who aspired to invent new methods to accelerate data gathering for numerous important alloy systems and to perform more systematic study of the science of alloys. It is incredibly heartening for me to have my name associated with previous winners. This award inspires me to continue inventing new methodologies and collecting more critical data to help design new alloys to address the societal needs for a better environment and joyful living."

ELLEN SWALLOW RICHARDS DIVERSITY AWARD

This award recognizes an individual who, in the remarkable pioneering spirit of Ellen Swallow Richards, has helped or inspired others to overcome personal, professional, educational, cultural, or institutional adversity to pursue a career in minerals, metals, and/or materials.

Mary Juhas
Associate Vice President, The Ohio State University
Citation: *For her untiring efforts at recruitment, retention, and advancement of women in the science, technology, engineering, mathematics, and medicine (STEMM) disciplines.*

"We all stand upon the shoulders of Ellen Swallow Richards, a pathfinder, trailblazer, and influencer whose contributions remain relevant and never more important to our global village. It is with great humility that I express my gratitude to Megan Cordill and the awards committee, and especially to Jeffery and Geraldine McCulley Wadsworth for endowing the award. My TMS membership has afforded me the fantastic opportunity to learn, share, and engage with members of the materials science community from academia, government, and industry over many years. While I have been quite pleased to see the face of materials science become increasingly diverse during my career, there is always more work to be done."

FRANK CROSSLEY DIVERSITY AWARD

Awarded to an individual who has personally overcome personal, professional, educational, cultural, or institutional adversity to pursue a career in minerals, metals, and/or materials.

T. Ben Britton
Reader in Metallurgy and Microscopy/ Associate Professor, Imperial College London/University of British Columbia
Citation: *As an LGBTQ+ individual, Dr. Britton has overcome barriers to become a world-leading materials scientist and engineer and he fights for increasing equality for all.*

"TMS creates and sustains an international community of scientists and engineers, drawing together academics and industrialists via its annual meeting, papers, and digital media. This makes the world smaller and more accessible, enabling us to share ideas and know-how and build friendships across the world. I am especially impressed at the contributions of the TMS Diversity, Equity, and Inclusion Committee and its work to understand and address current and historic imbalances in our community, as well as drawing in more members and enabling us to create a more robust and sustainable community for all. As we all work together, I hope that more people will continue to reflect on their own journey, and look around the room more often to see, and address, instances where conscious, unconscious, and systematic bias create and sustain barriers which limit equal participation for all, especially the most marginalized and those at the start of their careers."

WILLIAM D. NIX AWARD

Established to honor William D. Nix and his legacy, this award highlights and promotes continued progress and innovation relevant to research into the underlying mechanisms and mechanical behavior of macro-, micro-, and nanoscale materials.

George Pharr
Professor, Texas A&M University
Citation: *For development of methods for the quantitative determination of material mechanical response by nanoindentation and its use to elucidate fundamental mechanisms of material behavior.*

Presentation Title: "Damage Tolerance in Materials"

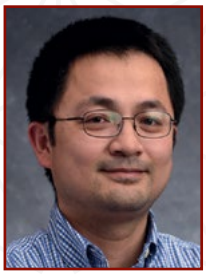
"I was thrilled to learn that I have been chosen by TMS as the next recipient of the William D. Nix Award. Knowing well what a giant William Nix has been in materials research and education, it is certainly a tremendous honor. My sincere thanks to TMS and all my materials friends and colleagues who made this possible."

EARLY CAREER FACULTY FELLOW

This award recognizes an assistant professor for his or her accomplishments that have advanced the academic institution where employed, and for abilities to broaden the technological profile of TMS.

James Pikul
Assistant Professor, University of Pennsylvania
Presentation Title: "Electrochemical Healing of Metals: A New Way to Repair Additive and Cellular Metals at Room Temperature"

"I am honored to be part of TMS and to further its important mission. I am also very grateful to the TMS Foundation for their support of young professionals. Their efforts enrich the TMS community by fostering a strong and supportive community for young members and early career scientists. Through TMS events, the TMS Foundation catalyzes relationships among professionals from industry, academia, and national laboratories. These diverse interactions create wonderful new ideas that advance engineering, science, and society. I look forward to participating and presenting in the Young Professional Tutorial Luncheon and to continued engagement with the TMS community."



Wei Xiong
Assistant Professor, University of Pittsburgh
Presentation Title: "Integrated Computational Materials Design for Alloy Additive Manufacturing"
"TMS provides a phenomenal platform for junior metallurgists to collaborate with and learn from other researchers and engineers in our community. It also creates unique opportunities for me to extend my network by connecting with peers in the industry, national laboratories, and academia. Since my first TMS annual meeting in 2013, I have learned a lot by giving presentations, organizing symposia, initiating professional development courses, and serving on committees. I am immensely honored to receive this prestigious award and will continue to support various activities organized by TMS. Due to the pandemic, we need to absorb many impacts with high uncertainties this year. I will keep onward with all TMS members, and, together, we expect victory."

FRONTIERS OF MATERIALS AWARD

This award is given competitively to top-performing early career professionals capable or organizing a Frontiers of Materials event comprising a hot or emergent technical topic at the TMS Annual Meeting & Exhibition.

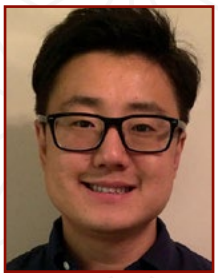
Huanyu (Larry) Cheng
Assistant Professor, The Pennsylvania State University
Symposium: 2021 Functional Nanomaterials: Translating Innovation into Pioneering Technologies
"I greatly benefit from interaction with peer researchers in multiple fields across the globe. This award provides a once-in-a-lifetime opportunity for me to meet and interact with the greatest minds in the interdisciplinary research that brings the materials with devices and biomedical applications. It would be an invaluable experience for me to access guidance and advice from the leading experts in person. It is also helpful to showcase some of the great research we have been doing at Penn State and establish new contacts and collaborations in the field, which will help take our research beyond the existing scope and open up new opportunities for my career."

Deep Jariwala
Assistant Professor, University of Pennsylvania
Symposium: Low-Dimensional Materials and Interfaces for Next Generation Computing
"TMS is one of the oldest professional societies in the world in the broad domain of materials research. It is the first international society that I was aware of, even as a sophomore in college without much know-how or understanding of the scientific or academic research world. This honor and recognition from TMS at this stage of my career is therefore truly special. I am further thrilled and excited to contribute my expertise, knowledge, and experience to TMS, and to organize a forward-looking symposium in my area of research. I hope this award-related symposium will expand the disciplinary horizons of materials and research areas for TMS leading to new collaborations and cross-fertilization of research ideas across the broad spectrum of materials researchers who are TMS members and attendees of the annual meeting."

Jessika Rojas-Marin
Assistant Professor, Virginia Commonwealth University
Symposium: Radiation Processing of Materials
"Being a member of TMS has always brought significant advantages to my professional development. The annual meetings I have attended were a tremendous educational and professional experience; I have learned from other researchers and have received updates on advances in diverse fields and those of particular interest to me. They have also been a great platform to reconnect with colleagues and meet professionals from different backgrounds. With the highly interdisciplinary scope of TMS in materials science, I have always found a program to share my research through oral and poster presentations with a very positive reception. Not to mention I have enjoyed the excellent student competitions! This award is a great honor and I am highly motivated to bring the topic of radiation processing to TMS. With this award, I aim to highlight the beneficial uses of ionizing radiation for materials manufacturing and processing and motivate a discussion on the potential advances in the field."

TMS BEST PAPER CONTEST

This award recognizes student essays on global or national issues as well as technical research papers relating to any field of metallurgy or materials science



Best Paper Award - First Place Graduate
Chanho Lee
Student, University of Tennessee, Knoxville
Paper Title: "Lattice-Distortion-Enhanced Yield Strength in a Refractory High-Entropy Alloy"
"TMS is one of the biggest and most well-known associations in the minerals, metals, and materials science fields. Thus, it is a great honor for me to be recognized by an outstanding Society with this award. I would like to sincerely thank my advisor, Peter K. Liaw, and my mentors, Saryu Jindal Fensin and Nan Li, for their invaluable support and guidance throughout my scientific research. This award will be a nice springboard for my future career development and help me to boost my confidence and achieve my academic goals."

Best Paper Award – Second Place Graduate
Zhongxia Shang
Student, Purdue University
Paper Title: "He Ion Irradiation Response of a Gradient T91 Steel"
"TMS has provided many valuable opportunities for the materials science and engineering community by connecting scientists and engineers all over the world. Particularly, it benefits young researchers like me most by offering us a worldwide platform to present our exciting and innovative work. As a TMS member, I feel very grateful to accept such a prestigious award. I really enjoy staying in such a professional and friendly community to pursue my academic career goal."

Best Paper Award – First Place Undergraduate
Lily Turaski
Student, Georgia Institute of Technology
Paper: "Thermodynamics and Kinetics of MAPbI3 Perovskite Processing"
"TMS and Material Advantage have made an immense impact on my education and career path. I attended my first TMS annual meeting as a freshman. I loved learning about innovations and discoveries at the forefront of materials research and meeting fellow materials science and engineering students, professors, and industry professionals. That first experience cemented my love of materials science and ensured I would be a regular conference-goer. Since then, I have had the opportunity to present research posters, participate in the Undergraduate Speaking Contest, and enter the Material Bowl Competition. I am so thankful that TMS, Battelle, and the Functional Materials Division are investing in students like me."

KAUFMAN CALPHAD SCHOLARSHIP

Awarded through CALPHAD Inc. and the TMS Foundation to sophomore or junior undergraduate students majoring in metallurgical engineering, materials science and engineering, or minerals processing/extraction programs.

Hrushikesh Sahasrabuddhe
Student, Indian Institute of Technology Bombay
"I am deeply honored to receive the Kaufman CALPHAD Scholarship for 2021. TMS and Material Advantage have enabled me to attend conferences focusing on cutting-edge technology and some high-impact research. After interacting with the students, industry persons, and all other professionals during TMS's webinars and conferences, I am highly motivated and enthusiastic about contributing towards the advancement of materials research. After graduation, I plan to enroll in doctoral studies in the field of mechanical behavior of materials and wish to start an enterprise alongside it. I am sure that this scholarship will help me in realizing my future goals and ambitions!"

AIME AWARDS

TMS/SME/AIME JAMES DOUGLAS GOLD MEDAL

Honors distinguished achievement in nonferrous metallurgy, including both the beneficiation of ores and the alloying and utilization of nonferrous metals. This award is administered through TMS's Extraction & Processing Division (EPD) and the Society for Mining, Metallurgy & Exploration's (SME) Minerals & Metallurgical Processing Division (MPD).

Maurits Van Camp
Director Research & Innovation, Umicore
Citation: *A visionary leader and entrepreneur who has dedicated his professional life to develop innovative technological solutions and promote collaboration between industry, academia, and governmental organizations.*

AIME CHAMPION H. MATTHEWSON AWARD

Awarded to the author(s) of a paper, or a series of closely related papers, representing the most notable contribution to metallurgical science during the period under review.


Daniel M. Field, ***U.S. Army Combat Capabilities Command, U.S. Army Research Laboratory*** **(left), and David C. Van Aken,** ***Curators' Teaching Professor, Missouri University of Science and Technology*** **(right)**

Paper: "Dynamic Strain Aging Phenomena and Tensile Response of Medium-Mn TRIP Steel," *Metallurgical and Materials Transactions A*, April 2018 (Topic Area: Mechanical Behavior).

"TMS has been instrumental in providing the platform for publishing my work. I am thankful for all of the journals and conferences that TMS supports to provide healthy scientific discourse to promote the art and science that is metallurgy. I am thankful for the recognition of this award and all that it signifies about my work and its impact to steel metallurgy," Field said. Van Aken added, "I owe a great debt of gratitude to TMS for their publication and continued recognition of our manganese alloyed steel research. I would also like to acknowledge Missouri University of Science and Technology for giving me an opportunity to have a balanced career in both teaching and research. Excellence in teaching garnered some truly talented students to my research group and their work has been recognized by these awards."



Pictured, left to right: Adam L. Pilchak, ***Senior Materials Research Engineer, U.S. Air Force Research Laboratory (AFRL);*** **Gordon A. Sargent,** ***Dean Emeritus, University of Dayton/Gordon A. Sargent Consulting;*** **and S. Lee Semiatin,** ***Senior Scientist Emeritus, AFRL***

Paper: "Early Stages of Microstructure and Texture Evolution during Beta Annealing of Ti-6Al-4V," *Metallurgical and Materials Transactions A*, March 2018 (Topic Area: Materials Processing).

"I am very grateful to TMS and the awards selection committee for recognizing our paper with this prestigious award. Though my research directions have evolved over the years and my work has shifted from very basic toward very applied science, TMS has consistently remained a place to interact with world-class researchers in every and all aspects of materials science," Pilchak said. "Sharing this award with my co-authors is one of the pinnacles of my career. I first joined TMS as an undergraduate student. These outstanding organizations have been vitally important in the subsequent development of my professional career as an educator and researcher in the complex disciplines of materials science and engineering," Sargent added. "I view *Metallurgical and Materials Transactions* (*MMT*) as my 'home' journal and TMS as my 'home' technical society. Having published papers in *MMT* in each of the five decades of its existence, the Mathewson recognition holds a very special meaning to me. I also wish extend a sincere thanks to the editors and production staff at *MMT*," Semiatin said.

AIME ROBERT LANSING HARDY AWARD

For more than half a century, this award has recognized professionals under the age of 35 in the broad fields of metallurgy and materials science for exceptional promise of a successful career.

Bryce Meredig
Citrine Informatics

Citation: *For pioneering work in the use of artificial intelligence to accelerate materials design and discovery.*

"I am honored to receive this award, which is a good opportunity to reflect on how much our success depends on investments by others in our growth and goals. I am grateful to have worked with outstanding mentors, colleagues, and collaborators, without whose support my career path would not have been possible. I look forward to continued engagement at the TMS annual meetings, which have featured excellent programming on data-driven materials science for many years now, and with TMS more broadly."

AIME HENRY DEWITT SMITH SCHOLARSHIPS

This scholarship is awarded to graduate students majoring in mineral, metals, and/or materials engineering. The award aims to advance the mineral industries by assisting students in the pursuit of graduate education in mining, metallurgical, materials, or petroleum-related disciplines.

Faith Gantz
Student, University of North Texas

"Being a member of TMS and Material Advantage offers valuable opportunities by providing students with resources like travel grants,

scholarships, and conference experiences. I have been an active member since the start of my graduate career, where I learned of opportunities such as the Henry DeWitt Smith Scholarship. It is a great privilege to win this prestigious award. The benefits will go towards continuing my education in graduate school for a Ph.D. in materials science. My research consists of the characterization, development, and processing of shape memory alloys for aerospace applications. After completing my degree, I plan to continue with R&D of shape memory alloys or focus on quality control/failure analysis in industry or at a national laboratory."

Yang Shen
Student, Northeastern University
"It's my great honor to receive the TMS/AIME Henry DeWitt Smith Scholarship. I have been a Material Advantage member since 2017 and received a TMS travel grant to attend the TMS 2018 Annual Meeting & Exhibition which gave me a valuable opportunity to enhance my presentation and communication skills in such a wonderful Society. Currently, I am the chair of the Material Advantage chapter of Northeastern University-China, which has enriched my leadership experiences and strengthened academic communications in different fields. After graduation, I would prefer to join a research team working on physical metallurgy and welding metallurgy. This scholarship is an affirmation of my hard work and will encourage me to keep going in my academic career."

ACTA MATERIALIA AWARDS

GOLD MEDAL AWARD

Awarded to a proven leader in materials science and engineering whose research has significantly impacted the development of the discipline.

Guenter Gottstein
Distinguished Senior Professor, RWTH Aachen University

SILVER MEDAL AWARD

This award honors scientific contributions and leadership from academic, industry, and public sector leaders in the midst of their careers.

Julie Cairney
Director of Australian Centre for Microscopy and Microanalysis, University of Sydney

HOLLOMON MATERIALS & SOCIETY AWARD

This recognition honors an individual who promotes understanding of the relationship and interactions between materials technology and societal interest or needs.

Qingjie Zhang
Professor, Wuhan University of Technology

ACTA MATERIALIA UNDERGRADUATE SCHOLARSHIP

Supported by the generosity of Acta Materialia Inc. and issued under the TMS Foundation, this scholarship is available to undergraduate students majoring in metallurgical engineering, materials science and engineering, or to undergraduate students with a significant interest in the materials area.

Nicholas D'Attilio
Student, South Dakota School of Mines & Technology
"I joined Material Advantage during my first semester of college. Through my membership I gained access to a myriad of journals and other professional resources that have proved useful throughout my undergraduate career. Additionally, my membership in Material Advantage provided me the opportunity to attend the 2020 TMS Annual Meeting & Exhibition in San Diego. Attending the TMS conference was an excellent experience to learn about current research in the materials field and to grow my professional circle. I look forward to graduating in May and am currently searching for jobs. I intend to work in industry for a few years and then return to graduate school."

Baily Syring
Student, University of Wisconsin-Madison
"Involvement in TMS and Material Advantage (MA) have been critical in helping me explore my academic and career interests within materials science. Through the University of Wisconsin-Madison chapter of MA, I have been able to connect with other materials science and engineering students as well as professors and other professionals within the materials discipline. I am incredibly grateful to the TMS Scholarship Committee and Acta Materialia Inc. as this scholarship substantially helps the accessibility of my education. After graduation, I plan to begin my professional career in materials science, where I will continue to expand my knowledge of materials."

MARY FORTUNE GLOBAL DIVERSITY AWARD

With this distinction, Acta Materialia not only intends to honor outstanding contributions to the field, but also to improve the awareness of the fundamental importance and diversity of materials research, both within the community and the public at large.

Katalin Balázsi
Head of Thin Film Physics Department, Hungarian Academy of Sciences

BRIMACOMBE PRIZE

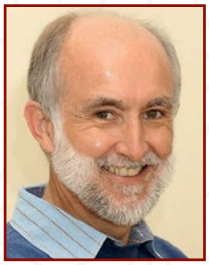
The Brimacombe Prize was designed to speak symbolically of the achievements of its recipients while perpetuating these attributes that J. Keith Brimacombe set as standards for his own character and career: a creator of new knowledge through research excellence, a visionary and innovator for a better global society, a world ambassador integrating science and technology with creative insight. This award is supported by the Brimacombe Fund, an endowment held by the Vancouver Foundation.

Philippe Jarry
Technical Expert, Constellium C-TEC

DIVISION AWARDS

In addition to the many Society-level awards administered by TMS, each of the Society's five divisions provide opportunities for recognition specific to the work performed in their areas of technical interest. More information on each of these awards, as well as quotes and photos from recipients, are available on awards.tms.org.

EXTRACTION & PROCESSING DIVISION (EPD) DISTINGUISHED LECTURE AWARD

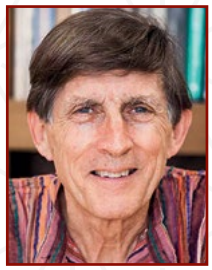


Rodney Jones
Consultant, Mintek
Citation: *A researcher in the field of pyrometallurgy for nearly four decades and regarded as one of the foremost speakers.*
Lecture: "Ferronickel—Thermodynamics, Chemistry, and Economics"
"I feel privileged to have had a career in pyrometallurgy that exposed me to many commodities, technologies, and countries, and I am grateful to have worked with many wonderful and inspiring people. Participation in international technical conferences has enriched my life greatly and has enabled the two-way sharing of information that allows the industry and the people within it to grow and develop. Numerous valuable friendships have grown from this too. In becoming a recipient of this award, I am humbled to be in the company of so many truly great metallurgists that have gone before me."

EPD DISTINGUISHED SERVICE AWARD

Andreas Siegmund
Principle, LanMetCon LLC
Citation: *In recognition of selfless service to the Extraction & Processing Division, the global nonferrous industry, and his 20 years' leadership of the international Lead-Zinc symposium.*
"It is a great honor to receive this distinguished award from the EPD of TMS. I would like to thank my nominator, Joe Grogan, and the entire EPD for selecting me as this year's recipient. It has been a pleasure to participate in multiple committee functions within EPD and to be part of co-organizing several conferences on behalf of TMS over the last 25 years. This award will always remind me of my long professional association with TMS, EPD, and the gained friendships with many of its members."

EPD SCIENCE AWARD

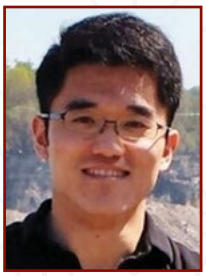


Pictured, left to right: Peter Hayes, ***Professor, University of Queensland (UQ);*** **Evgueni Jak,** ***Director, UQ;*** **and Suart Nicol,** ***R&D Engineer, Gopher Resource/UQ***
Paper: "Microstructure Evolution During Controlled Solidification of 'Fe_2O_3'-CaO-SiO_2 Liquids in Air," *Metallurgical and Materials Transactions B*, December 2019.
"I am honored to have been recognized by the EPD for my work. It is rewarding to see my work being viewed by others as having advanced the science of extractive metallurgy and benefiting industrial operations," said Nicol. "Recognition of the importance of the fundamental research on thermodynamics and phase equilibria by colleagues—professionals in the field—is very valuable to me personally and to the whole team. We believe the metallurgy and recycling industry is undergoing a significant

transformation towards quantitative scientifically—based description of complex processes and, therefore, opening further opportunities for improvements and optimization of industrial operations. This award is valuable to encourage further progress," Jak added. "We live in a period of dramatic changes in technologies, and the expanding use and application of metals in these advanced technologies. We need to continue our research efforts in this field to support the supply of critical raw materials as we seek ways to develop a sustainable society," said Hayes.

EPD TECHNOLOGY AWARD



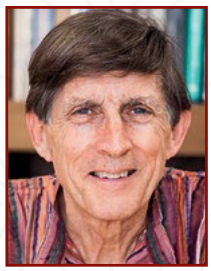



Pictured, left to right: Mansoor Barati, ***Professor, University of Toronto (U of T);*** **Feng Liu,** ***Student, U of T;*** **Dawei Yu,** ***Professor, Central South University;*** **and Jiajing Zhang,** ***Associate Director, Capitech Venture Capital Co. Ltd.***

Paper: "Thermal Upgrading of Nickeliferous Pyrrhotite Tailings for the Recovery of Nickel in the Form of Ferronickel Alloy," *Metallurgical and Materials Transactions B*, October 2019.

"It is a great honor to be the recipient of the TMS EPD Technology Award, which is a high recognition of our previous work on the pyrometallurgical extraction of nickel," said Yu. "TMS provides a great platform for us to communicate and network. Through this platform, great ideas are exchanged, which further advances the field," Liu added. "It is rewarding to see the recognition of this work and the students working on the project. I am grateful to TMS for its multi-faceted contributions to elevating our discipline, running high-quality conferences, publishing top metallurgical journals, and forming a vibrant technical community," Barati said.

EPD PYROMETALLURGY BEST PAPER AWARD

Jiang Chen, ***Australian National University*****, and Peter Hayes,** ***Professor, University of Queensland***

Presentation: "Mechanisms and Kinetics of Reduction of Solid NiO in CO/CO_2 and CO/Ar Gas Mixtures," *Metallurgical and Materials Transactions B*, December 2019.

"I'm very honored to receive this award for our recent publication. I'd like to thank everyone who has supported this research work, Akbar Rhamdhani as the paper recommender, and the EPD Pyrometallurgy Committee for choosing our paper for this award. This award is an enormous encouragement for me to continue to contribute to the metallurgy research community," said Chen.

"Thanks to the TMS EPD awards committee for this honor. I think it is important that we continue to provide new fundamental scientific information to enhance our knowledge and research capability. For me, breaking new ground is exciting and it is rewarding to know that others working in this field value this research," Hayes added.

FUNCTIONAL MATERIALS DIVISION (FMD) JOHN BARDEEN AWARD

James R. Chelikowsky
W.A. "Tex" Moncrief Jr. Chair of Computational Materials, University of Texas at Austin

Citation: *For his leadership and pioneering contributions within the science of electronic materials.*

"I am deeply honored to receive this award, especially one named for John Bardeen, a true icon of condensed matter physics. His fundamental work on surfaces and interfaces continues to be an ongoing inspiration in my career. I am truly humbled to be included within the group of previous winners whose body of work encompasses some of the best science in electronic materials. TMS deserves credit for its tireless work in promoting the science and technology of materials."

FMD DISTINGUISHED SCIENTIST/ ENGINEER AWARD

Michael E. Manley
Senior Researcher, Oak Ridge National Laboratory
Citation: *For experimental research on thermophysical properties of materials at high temperatures, and the discovery of intrinsic localized modes in anharmonic materials.*
"I am thrilled and honored to receive this award. I was first introduced to TMS as a graduate student in 1997 and have remained involved ever since. The connections and friendships forged through TMS have played a vital role in my career. I am enthusiastic about engaging in TMS activities for many years to come."

LIGHT METALS DIVISION (LMD) DISTINGUISHED SERVICE AWARD

Alan Luo
Professor & Director, The Ohio State University
Citation: *For outstanding contributions to the light metals industry and sustained services to LMD and TMS.*
"I am honored to receive the Distinguished Service Award from the LMD which has been my home division since joining TMS as a graduate student about 30 years ago. I really appreciate my colleagues and friends at TMS and in the LMD for their support and recognition of my work with LMD. I will continue to advance light metals technology and educate the next generation of engineers and researchers for the light metals community."

EPD/LMD *JOURNAL OF SUSTAINABLE METALLURY* BEST PAPER AWARD

Mikael Lindvall, *SSAB AB*; Janice Bolen, Lily Lai Chi So, Mahdi Mahdi, Darryl Metcalfe, and Isabelle Nolet, *Hatch Ltd.*; Sina Mostaghel, *SNC-Lavalin*; Johannes Nell, *Tronox*; and Olle Sundqvist, *AB Sandvik Materials Technology*
Paper: "Stabilization of Stainless Steel Slag via Air Granulation," *Journal of Sustainable Metallurgy*, February 2019.

LIGHT METALS SUBJECT AWARDS

The following awards recognize individual excellence of papers presented at the previous year's TMS annual meeting in an LMD-sponsored session.

Aluminum Alloys

Anthony De Luca, *Empa - Swiss Federal Laboratories for Materials Science and Technology;* David Dunand, David Seidman, and Shipeng Shu, *Northwestern University*
Paper: "Effects of Mn and Mo Micro-additions on Al-Zr-Sc-Er-Si Mechanical Properties," *Light Metals 2020.*

Aluminum Reduction Technology

David LaJambe and Jayson Tessier, *Alcoa*; and Eric Poulin and Carl Duchesne, *Laval University*
Paper: "Anodic Incident Detection Through Multivariate Monitoring of Individual Anode Current Signals," *Light Metals 2020*.

Electrode Technology

Les Edwards and Maia Hunt, *Rain Carbon Inc.*; and Christopher Kuhnt, *Rain Carbon Germany GmbH*
Paper: "Anhydrous Carbon Pellets—An Engineered CPC Raw Material," *Light Metals 2020*.

Warren Peterson Cast Shop for Aluminum Production

Ragnhild Aune, Kai Erik Ekstroem, Catherine Kyung Won Solem, and Gabriella Tranell, *Norwegian University of Science and Technology*
Paper: "Evaluation of the Effect of CO_2 Cover Gas on the Rate of Oxidation of an AlMgSi Alloy," *Light Metals 2020*.

LMD MAGNESIUM TECHNOLOGY AWARDS

The following celebrate individual excellence of papers published in the previous year's volume of Magnesium Technology *on specific topics or presented during the TMS annual meeting at the Magnesium Technology Symposium.*

Application

Jan Bohlen, Karl-Ulrich Kainer, Gerrit Kurz, Dietmar Letzig, and Maria Nienaber, *Helmholtz-Zentrum Geesthacht*
Paper: "Variation of Extrusion Process Parameter for the Magnesium Alloy ME21," *Magnesium Technology 2020*.

Fundamental Research

Taylor Cain and Joseph P. Labukas, *U.S. Army Research Laboratory*
Paper: "Development of Ultra Lightweight, Corrosion Resistant Mg Alloys," *Magnesium Technology 2020*.

Student Paper

Trevor B. Abbott, *RMIT University*; Yahia Ali, Manijn Kim, Stuard D. McDonald, and Kazuhiro Nogita, *University of Queensland*
Paper: "The Independent Effects of Cooling Rate and Na Addition on Hydrogen Storage Properties in Hypo-Eutectic Mg Alloys," *Magnesium Technology 2020*.

Best Poster

Irene Beyerlein, Claire Weaver, and Shuozhi Xu, *University of California, Santa Barbara*; Abigail Hunter, *Los Alamos National Laboratory*; and Anil Kumar, *airisData*
Title: "Quantifying Dislocation Behaviour in Mg Using a Phase Field Dislocation Dynamics Model Multiple Active Slip Planes"

LMD LIGHT METALS AWARD

Pictured, left to right: **Caio César Amorim de Melo**, *R&D Specialist, Norsk Hydro Brasil (Norsk);* **Marcelo Montini**, *Norsk*; **Raphael Vieira de Costa**, *Norsk;* **Roseanne Barata Holanda**, *Research Assistant, SENAI Innovation Institute for Mineral Technology (ISi-TM);* **Alice Ferreira Cardoso**, *Undergraduate Intern, ISi-TM;* **Adriano Lucheta**, *Director, ISi-TM;* **Patricia Magalhães Pereira Silva**, *Research Assistant, ISi-TM;* and **Andre Luiz Vilaça do Carmo**, *Research Assistant, ISi-TM*

Paper: "Bayer Process Towards the Circular Economy—Soil Conditioners from Bauxite Residue," *Light Metals 2020.*

"We are very proud to receive this award. The SENAI Innovation Institute for Mineral Technologies (ISi-TM) is in its fifth year of existence and being recognized by TMS associates and peers is a great honor. The ISi-TM and Norsk Hydro Brasil R&D teams are working hard on the development of sustainable solutions to promote bauxite residue use, and to receive these awards indicates we are on the right path," said Lucheta.

LMD TECHNOLOGY AWARD

Norbert Hort
Helmholtz-Zentrum Geesthacht
Citation: *For outstanding contributions to research and development in the area of magnesium technology.*

MATERIALS PROCESSING & MANUFACTURING DIVISION (MPMD) DISTINGUISHED SERVICE AWARD

James C. Foley
Group Leader, Los Alamos National Laboratory
Citation: *For exemplary service to MPMD and TMS through leadership of the MPMD Council, the TMS Program Committee, and our Society.*

"It is a great pleasure to be recognized by my peers for the contributions I have made to the MPMD and TMS. I hope that my service to the MPMD inspires others to continue to advance the profession and TMS like the past recipients of this award have inspired me. I look forward to my continued interactions with the current leaders of the MPMD and witnessing the development of future leaders of the division. Thank you to all who have contributed to my success."

MPMD DISTINGUISHED SCIENTIST/ ENGINEER AWARD

Eugene A. Olevsky
Dean & Distinguished Professor, San Diego State University
Citation: *For outstanding contributions to materials engineering education and sintering research including development of the modern sintering theories and fundamental studies of field-assisted powder consolidation technologies.*

"I am extremely proud and honored to receive this award. TMS is one of the oldest and broadly internationally recognized professional societies in materials engineering. TMS activities are very important for me, my colleagues, and my students. I am very grateful to my nominator and the members of the MPMD Nominations & Awards Committee for granting me this prestigious distinction!"

STRUCTURAL MATERIALS DIVISION (SMD) DISTINGUISHED SCIENTIST/ ENGINEER AWARD

Kevin Hemker
Professor and Chair, Johns Hopkins University
Citation: *For pioneering work in quantifying the underlying atomic, nano-, and microstructural details that govern the mechanical response, performance and reliability of materials.*

SMD DISTINGUISHED SERVICE AWARD

Eric Huron
Manager, Structural Materials Development, GE Aircraft Engines
Citation: *For providing distinguished service to the structural superalloys community over the past thirty years through his leadership of TMS conferences and symposia.*

"I am so grateful for this award because it was made possible by collaboration and teamwork with many TMS colleagues, rather than any individual contribution by me. I have been very fortunate to work with peers who are highly competent materials professionals from industry, academia, and government agencies. I find these collaborations highly satisfying and effective. I encourage all members of TMS, throughout their career, to take advantage of these peer networks and work together to both advance their own learning and career experiences as well as strengthening the entire materials engineering community in the process. My thanks to TMS, my colleagues, and the SMD for the nomination and award."

LMD/EPD ENERGY BEST PAPER AWARDS

These awards recognize the individual excellence of a paper exemplifying the application of science in solving a practical problem, and therefore must be technological in nature and present new and significant information related to an energy topic.

Professional

Zhihe Dou, Chao Lv, Ting-an Zhang, and Qiuyue Zaho, *Northeastern University*
Paper: "Simulation of Process and Reactor Structure Optimization for CeO_2 Preparation from Jet-Flow Pyrolysis," *JOM*, May 2019.

Xiaoxiao Geng and Hao Wang, *University of Science and Technology Beijing*; Asad Ullah, *Karakoram International University Gilgit*; Weihua Xue, *Liaoning Technical University*; Song Xiang, *Guizhou University*; Li Meng, *Central Iron and Steel Research Institute*; and Guang Ma, *Global Energy Interconnection Research Institute Co. Ltd.*
Paper: "Prediction of Continuous Cooling Transformation Diagrams for Ni-Cr-Mo Welding Steels via Machine Learning Approaches," *JOM*, February 2020.

Student

Joseph Litrel, *Electric Boat*; Donna Post Guillen, *Idaho National Laboratory*; and Michael McKellar, University of Idaho
Paper: "Investigation of Performance Enhancements for Air Brayton/ORC Combined Cycles for Small (~2 MWe) Power Systems and a Moderate Heat Source Temperature," *JOM*, May 2019.

Bing Li, Vilas Pol, and Vikas Tomar, *Purdue University*; Thomas Adams, *Naval Surface Warfare Center*; and Corey Love, *U.S. Naval Research Laboratory*
Paper: "Integrated Sensor Network and Battery Management System for State of Health Estimation and Safety Control of Lithium-ion Batteries"

EPD MATERIALS CHARACTERIZATION AWARDS

The following awards acknowledge the individual excellence of papers published or posters presented on the topic of materials characterization.

Best Paper Award – First Place

Virginia Bertolo, Quanxin Jiang, and Vera Popovich, *Delft University of Technology*; and Carey Walters, *Structural Dynamics, TNO*
Paper: "Effect of Microstruture on Cleavage Fracture of Thick Section Quenched and Tempered S690 High Strength Steel," *Characterization of Minerals, Metals, and Materials 2020.*

Best Paper Award – Second Place

Ramasis Goswami, *Naval Research Laboratory*; Tanjore Jayaraman and Ganesh Varma Thotakura, *University of Michigan-Dearborn*
Paper: "Influence on the Structural and Magnetic Properties of the Pre-alloyed Gas-atomized Maraging Steel Powder During Mechanical Milling," *Characterization of Minerals, Metals, and Materials 2020.*

Best Poster Award – First Place

Marc de Graef, Maxwell Li, Nisrit Pandey, and Vincent Sokalski, *Carnegie Mellon University*
Title: "Observation of Topological Defects in Synthetic Antiferromagnets with Inverted Dzyaloshinskii-moriya Interaction"

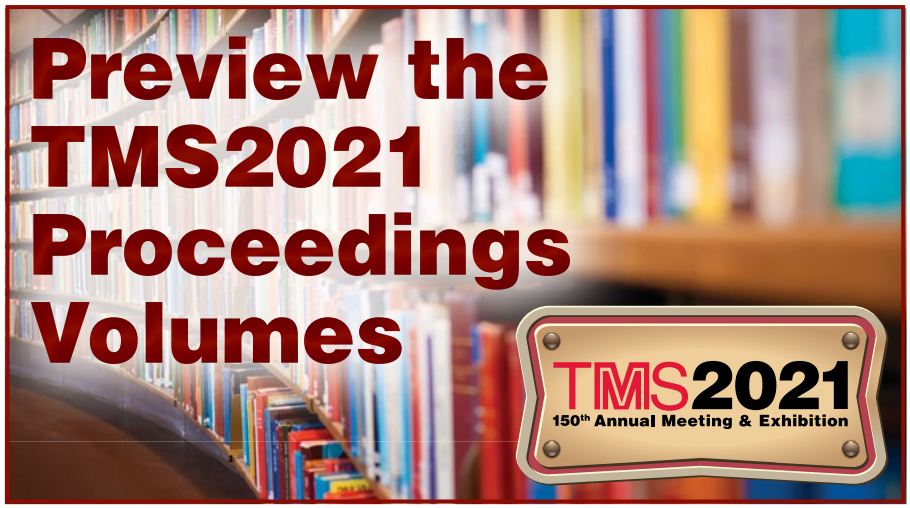
Best Poster Award – Second Place

Wesley Higgins and George Pharr, *Texas A&M University*
Title: "High Strain Rate Nanoindentation of Single Crystalline Metals"

Best Poster Award – Third Place

Hiroto Ishii, *Tokyo Electric Power Company Holdings Inc.;* Ken Kurosaki, *Kyoto University;* Hiroaki Muta and Yuji Ohishi, *Osaka University*; and Masayoshi Uno, *University of Fukui*
Title: "Wettability of Liquid Phase Caesium Compounds Against Metal Oxides Including UO_2 and ThO"

JOM, Vol. 73, No. 2, 2021
https://doi.org/10.1007/s11837-020-04540-7



Registrants of the TMS 2021 Annual Meeting & Exhibition (TMS2021) will have free, online access to the meeting's proceedings publications as a benefit of attending. For those who are unable to register for TMS2021, 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, and a 20% discount on TMS non-proceedings titles published with Springer. The discount codes that you need to enter during checkout are presented at www.tms.org/Bookstore when you are logged in to the TMS website.

Read on to learn more about each of the TMS2021 titles.

Characterization of Minerals, Metals, and Materials 2021

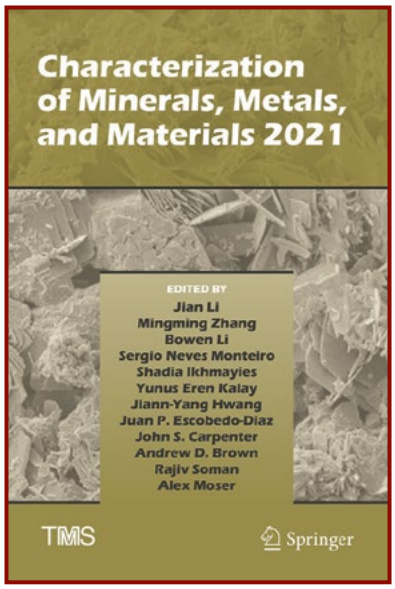
This collection focuses on the advancements of characterization of minerals, metals, and materials and the application of characterization results on the processing of these materials. Advanced characterization methods, techniques, and new instruments are emphasized. The book explores scientific processes to characterize materials using modern technologies, and focuses on the interrelationships and interdependence among processing, structure, properties, and performance of materials.

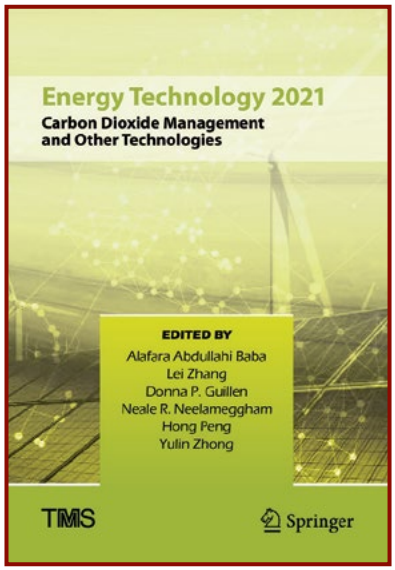
Energy Technology 2021: Carbon Dioxide Management and Other Technologies

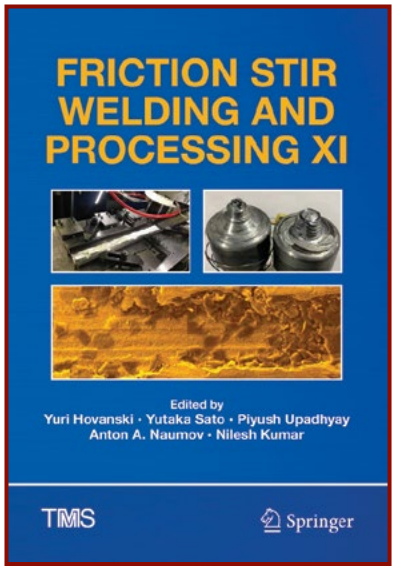
This collection addresses the pressing needs for sustainable technologies with reduced energy consumption and environmental pollutions and the development and application of alternative sustainable energy to maintain a green environment and efficient and long-lasting energy supply. The volume also covers a broad range of mature and new technological aspects of sustainable energy ecosystems and explores processes that improve energy efficiency, reduce thermal emissions, and reduce carbon dioxide and other greenhouse emissions.

Friction Stir Welding and Processing XI

This collection presents fundamentals and the current status of friction stir welding (FSW) and solid-state friction stir processing of materials and provides researchers and engineers with an opportunity to review the current status of the friction stir related processes and discuss the future possibilities. Contributions cover various aspects of friction stir welding and processing including their derivative technologies. These proceedings represent the eleventh symposium on Friction Stir Welding and Processing, held under the auspices of TMS. These historic proceedings represent 30 years of study, research, and implementation since the initial FSW patent was filed in 1991.





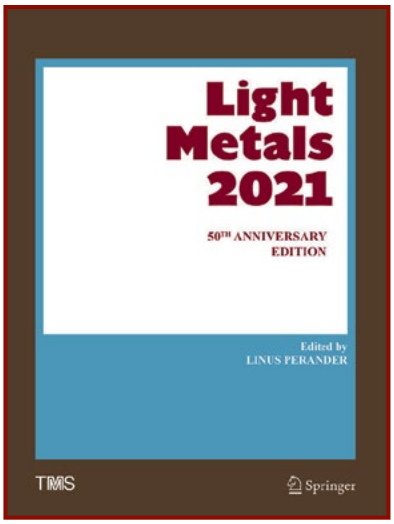


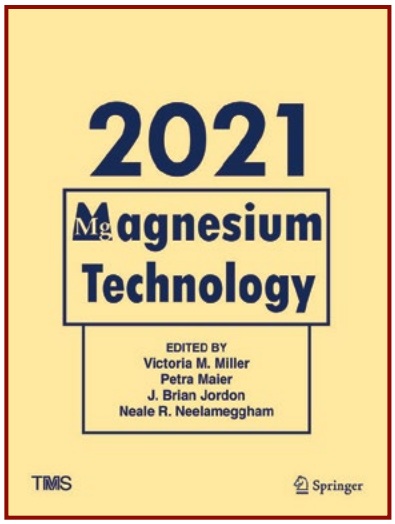
Light Metals 2021

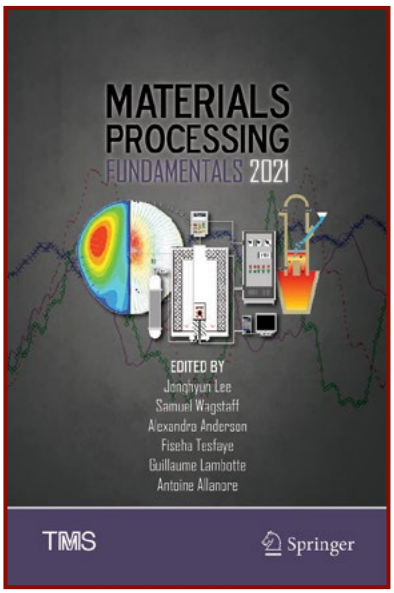
The annual *Light Metals* volume—celebrating its 50th anniversary this year—has become the definitive reference in the field of aluminum production and related light metal technologies. The 2021 collection includes papers from the following symposia: Alumina and Bauxite; Aluminum Alloys, Processing, and Characterization; Aluminum Reduction Technology; Aluminum Reduction Technology Across the Decades: An LMD Symposium Honoring Alton T. Tabereaux, Halvor Kvande, and Harald A. Øye; Cast Shop Technology; and Electrode Technology for Aluminum Production.

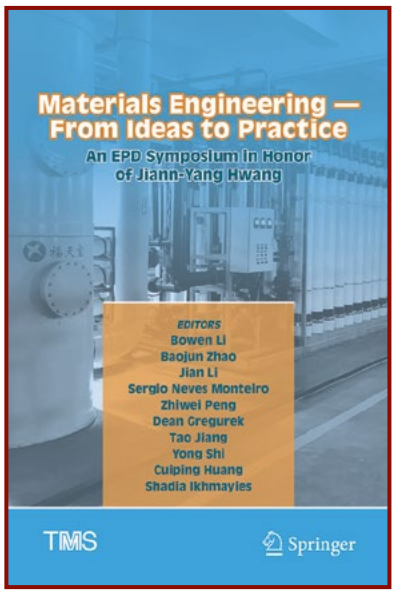
Magnesium Technology 2021

The Magnesium Technology Symposium, the event on which this collection is based, is one of the largest yearly gatherings of magnesium specialists in the world. Papers represent all aspects of the field, ranging from primary production to applications to recycling. Moreover, papers explore everything from basic research findings to industrialization. *Magnesium Technology 2021* covers a broad spectrum of current topics, including novel extraction techniques; primary production; alloys and their production; thermodynamics and kinetics; cast products and processing; wrought products and processing; forming, joining, and machining; corrosion and surface finishing; structural applications; degradation and biomedical applications; and several others.









Materials Engineering—From Ideas to Practice: An EPD Symposium in Honor of Jiann-Yang Hwang

This collection honoring professor Jiann-Yang Hwang focuses on characterization and processing development in minerals, metals, and materials. Topics include but are not limited to characterization methodology of minerals, metals, and materials; microwave-assisted material processes; recycling and reuse of metallurgical byproducts; materials for hydrogen storage; wastewater treatment and environmental protection; natural materials for value-added applications; and principles and interactions of material characterization and manufacturing processing. Hwang is an internationally known expert with a career of more than 40 years in the fields of mineral processing, metallurgy, water treatment, microwave-assisted material process, hydrogen storage, and by-product recycling.

Materials Processing Fundamentals 2021

This volume covers various aspects of the fundamentals, synthesis, analysis, design, monitoring, and control of metals, materials, and metallurgical processes and phenomena. Topics represented include but are not limited to experimental, analytical, physical, and computer modeling of physical chemistry and thermodynamics; modeling of the transport phenomena in materials processing and metallurgical processes involving iron, steel, nonferrous metals, and composites; second-phase particles in metals and processes and the fundamentals on nucleation, growth, motion, and removal of these particles from the molten metal or reactors; physical chemistry, thermodynamics, and kinetics for the production and refining of rare earth metals; and control of industrial processes in the field of extraction and processing of metals and materials.

Metal-Matrix Composites: Advances in Analysis, Measurement, and Observations

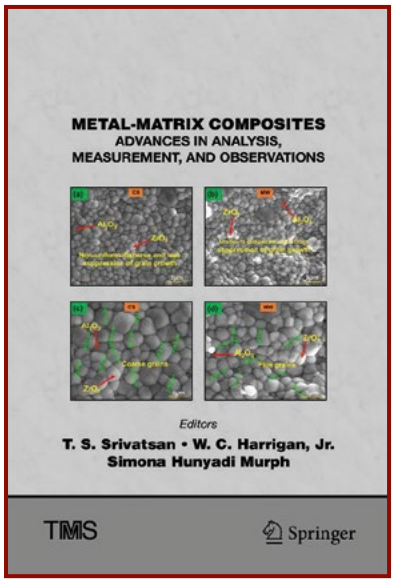
This collection brings together engineers, scientists, scholars, and entrepreneurs to present their novel and innovative contributions in the domain specific to metal-matrix composites and on aspects specific to modeling, analysis, measurements, and observations specific to microstructural advances. Topics include but are not limited to metals and metal-matrix composites; nano-metal based composites; and inter-metallic based composites. Contributions in the above topics connect to applications in industry-relevant areas: automotive, energy applications, aerospace, failure analysis, biomedical and healthcare, and heavy equipment and machinery.

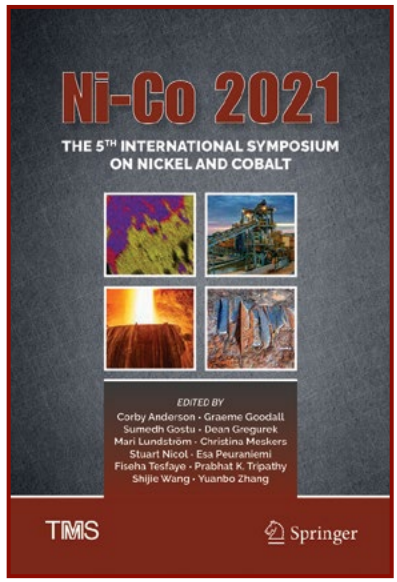
Ni-Co 2021: The 5th International Symposium on Nickel and Cobalt

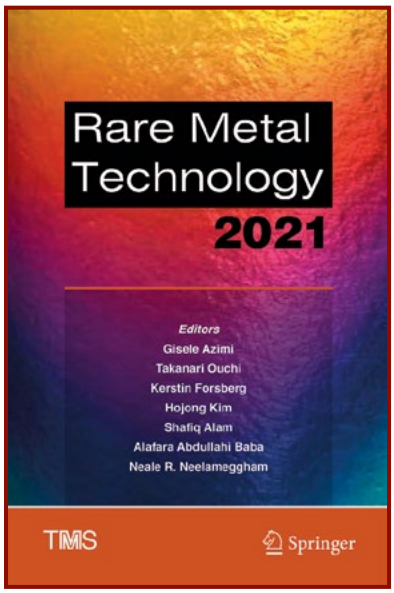
This volume presents information from operators, engineers, and researchers on all aspects of current and emerging processing technologies for nickel and cobalt. Contributions encompass metallurgical aspects of metals commonly associated with nickel and cobalt, such as copper and platinum group metals. Specific focus areas include but are not limited to nickel and cobalt markets, materials, applications, mineral processing, extractive metallurgy, battery materials, recycling, recovery of associated byproducts, and sulfide and laterite ore processing.

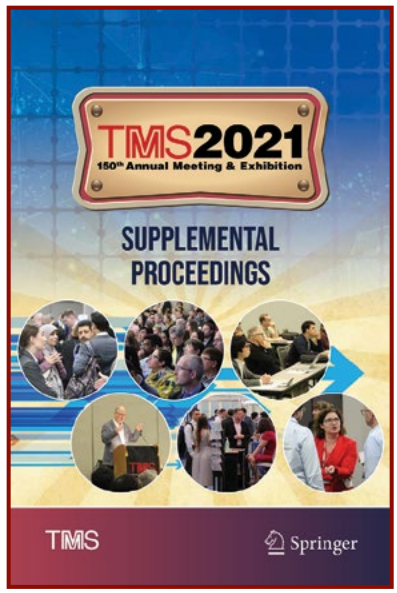
Rare Metal Technology 2021

This collection presents papers on extraction of rare metals as well as rare extraction processing techniques used in metal production. It covers metals essential for critical modern technologies, including electronics, electric motors, generators, energy storage systems, and specialty alloys. Contributions cover rare earth elements, energy storage materials, alloy elements, and materials for electronics. The contributions also cover various processing techniques in mineral beneficiation, hydrometallurgy, separation and purification, pyrometallurgy, electrometallurgy, supercritical fluid extraction, and recycling.









TMS 2021 150th Annual Meeting & Exhibition Supplemental Proceedings

This collection features papers presented at the 150th Annual Meeting & Exhibition of The Minerals, Metals & Materials Society. The contributions represent 56 symposia from the meeting.

JOM, Vol. 73, No. 2, 2021
https://doi.org/10.1007/s11837-020-04541-6

A Different Kind of MS&T: Virtual Meeting Featured Live Events and On-Demand Technical Talks

Kelly Zappas

Technical Meeting and Exhibition
MS&T20
MATERIALS SCIENCE & TECHNOLOGY

More than 1,100 registrants from around the world participated in live presentations November 2–6, and accessed recorded talks on demand through December 2020 as part of MS&T20 Virtual, the first all-online installment in the Materials Science & Technology (MS&T) Conference series. MS&T20 Virtual consisted of more than 80 symposia in 13 topic areas, delivering nearly 900 technical presentations in all.

While the virtual format offered a different experience from an in-person conference, attendees were still able to participate in the broad selection of technical programming that they've come to expect from MS&T meetings. The virtual platform also offered attendees one specific benefit over an in-person meeting: the ability to view concurrent sessions. Because all presentations were recorded in advance and available on demand for nearly two months, participants didn't have to choose between conflicting sessions. They could watch them all.

In addition to pre-recorded technical presentations on specific topics, MS&T20 Virtual offered live plenary talks, town hall sessions, panel discussions, student events, and exhibitor presentations throughout the week. These live events covered broad-interest topics and included conversations about how diversity makes our community stronger, an examination of the role of data sharing and integration in materials, a look at current trends in engineering education, and a discussion of tips and advice for graduates preparing to enter the workforce.

MS&T20 was coordinated by three leading materials-related societies: TMS, the American Ceramic Society (ACerS), and the Association for Iron & Steel Technology (AIST). **Carl Cady** of Los Alamos National Laboratory represented TMS on the 2020 MS&T Program Coordinating Committee, which also included **Chirag Mahimkar,** Big River Steel (committee chair and AIST representative), and **Shen Dillon,** University of Illinois at Urbana-Champaign (ACerS representative).

Town Hall Looks to Broaden Participation in MSE

"Materials science in and of itself was born out of the intersection of multiple disciplines," said **Karl Reid**, executive director, National Society of Black Engineers, during **Broadening Participation in the Materials Science and Engineering Profession**, a town hall event held at MS&T20 Virtual. "Intersections create new concepts and new ideas, which is why diversity matters."

Reid was the keynote speaker at the town hall, which explored the topics of diversity, equity, and inclusion in materials science and engineering. The event also featured a presentation by **Olivia Graeve**, professor, Department of Mechanical and Aerospace Engineering, University of California, San Diego, who discussed her experiences with the Society of Hispanic Professional Engineers (SHPE) and the need to increase the number of Latino engineering faculty in the United States. Of the existing faculty, approximately 90% are immigrants, which means that only 10% of

Karl Reid (left), executive director of the National Society of Black Engineers, delivers the keynote presentation at MS&T20's Broadening Participation in the Materials Science and Engineering Profession town hall. Elizabeth Dickey (right), president-elect of ACerS, moderated the session.

Latino engineering faculty in the United States were born and raised in the country.

"This means that we are not educating Latinx students to become the next academics or the next engineering professors that can educate the next generation," said Graeve. "That's a problem that we need to solve."

Following these presentations, a live, in-depth panel discussion offered additional insights from Reid and Graeve, who were joined by panelists **Ellen Cerreta,** TMS vice president and division leader, Materials Science and Technology, Los Alamos National Laboratory; **Keith Bowman,** dean, College of Engineering and Information Technology, University of Maryland Baltimore County; and **Marc Brooks,** talent acquisition specialist, Nucor Corporation.

The full session has been made available to all viewers free-of-charge as a resource for the community. You can view the presentation through the TMS YouTube channel at www.youtube.com/ChannelTMS.

Plenary and Panel Discussion Look at Importance of Data Sharing

On Thursday, November 5, **Charles Ward,** chief of the Manufacturing and Industrial Technologies Division, Air Force Research Laboratory, offered an overview of **"Integrating Materials and Manufacturing,"** during the TMS/ASM Joint Distinguished Lectureship in Materials and Society, part of the MS&T20 Virtual plenary series.

"For manufacturing to thrive, quickly and efficiently integrating advances made in materials research will be critically important," he said.

Ward's presentation looked at how data could be more efficiently shared among researchers. One way to standardize the data being shared within the community, he said, is to look at working from a common glossary or thesaurus, and he looked to semantics to aid this approach.

"Semantics—the study of meaning—is the way in which we can describe concepts and link them so as to provide greater context," he explained. "It's used extensively in other disciplines as a way to describe data in a richer and more formalized manner. If we would all standardize terms with precise definitions, it would greatly ease the flow of data through the scientific and engineering domains."

This background information set the stage for a discussion of the Materials Genome Initiative (MGI), launched in 2011. The overall objective of the MGI, Ward explained, is to dramatically reduce the time to discover, develop, and deploy materials solutions at a fraction of the traditional cost.

A panel discussion held on Friday, November 6, **Materials Genome Initiatives and Materials R&D in the 2020s**, continued the conversation about the MGI.

Above: James A. Warren (top left), National Institute of Standards and Technology, led a discussion on Materials Genome Initiatives and Materials R&D in the 2020s with panelists Julie Christodoulou (top right), U.S. Office of Naval Research; Linda Sapochak (bottom left), U.S. National Science Foundation; and John Vetrano (bottom right), U.S. Department of Energy.

Left: Charles H. Ward delivered the TMS/ASM Joint Distinguished Lectureship in Materials and Society.

The four-person panel was moderated by **James A. Warren**, director, Materials Genome Program, Material Measurement Laboratory, National Institute of Standards and Technology.

Warren opened the session with a presentation on the current state of the MGI, discussing the progress made since its inception and the challenges still faced. One of the greatest challenges identified was in data sharing. He posed the question: what is keeping researchers from publishing their data?

Exhibitors & Sponsors

Seventeen organizations participated in the MS&T20 Virtual exhibit. Attendees could interact with these companies throughout the week, and platinum-level exhibitors each contributed virtual demonstrations to the live content portion of the conference. Platinum exhibitors included Thermo-Calc Software, Bruker, International Centre for Diffraction Data, and RoboMet: A UES Technology. Gold-level exhibitors were the U.S. Department of Energy National Energy Technology Laboratory and Nanomegas. Alpha Resources; Tescan; Zeiss; Photron; Rigaku; Hitachi; Proto X-Ray Diffraction; Wiley; *Materials*, published by MDPI; Buehler; and ABS were silver exhibitors.

"Asking someone to publish data is the wrong thing to ask," Warren explained. "What we really should be asking is: Wouldn't you like a place where you can put your data that allows you to do things that you want to do?"

If users are going to share their data, he said, they'll need a platform where they can combine data sets, build on prior work, visualize results, discover interrelationships between different types of data, and use artificial intelligence/machine learning on that data. To provide tools like this, Warren said, we would need to create a National Materials Data Network.

Following Warren's presentation, panelists **Julie Christodoulou**, U.S. Office of Naval Research; **Linda Sapochak**, U.S. National Science Foundation; and **John Vetrano**, U.S. Department of Energy, discussed MGI-related initiatives at each of their organizations and ideas for advancing the implementation of MGI initiatives.

Curricular Innovations Sessions Bring Together Academic Community

In 2011, TMS began sponsoring a series of sessions titled **Curricular Innovations and Continuous Improvement of Academic Programs (and Satisfying ABET along the Way): The Elizabeth Judson Memorial Symposium**. The series started as a way to help programs learn how to prepare for ABET evaluation visits but has expanded over the years to include broader discussions of interest to the academic community.

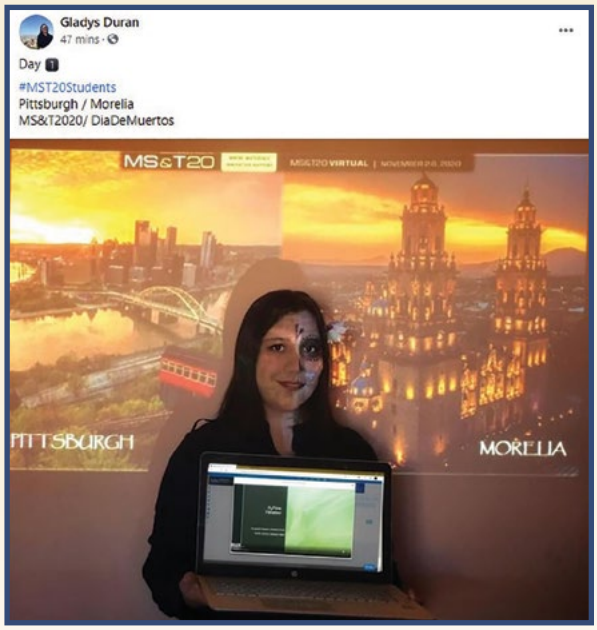
"The idea is that faculty who are going to MS&T primarily for their technical research can still have the opportunity to share and to learn what others are doing related to education," said **Jeffrey Fergus,** Auburn University, in his introduction to the live session held on Monday, November 2.

The 2020 installment of the symposium featured a series of presentations on curricular development and effective pedagogical approaches in materials science and engineering fields. As part of the symposium, Fergus led the panel discussion, **"Preparing Students for the Materials Genome Initiative Workforce,"** and **Kester Clarke**, Colorado School of Mines, moderated the panel, **"Workforce Development: Do Our Materials Science & Engineering Curricula Meet Workforce Needs?"**

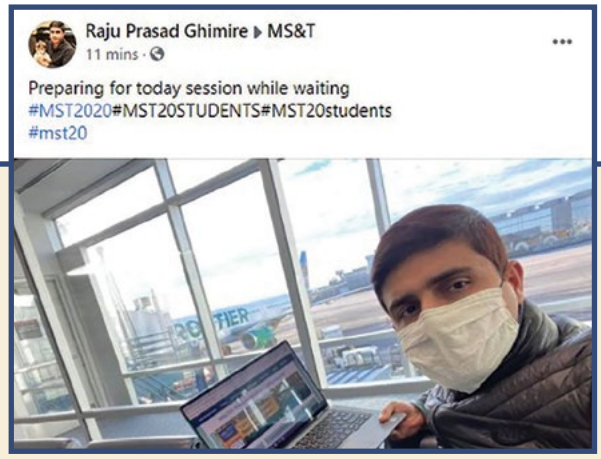
For more on the 2020 Judson symposium, see the article, "Transitioning from an In-Person to Online Format

Social Media Contest Winners

The Material Advantage student program sponsored a social media contest that asked students to post photos of themselves participating in MS&T20 Virtual. Winning entries were selected Monday through Wednesday, and each winner received a $100 cash prize.



Monday: Gladys Duran, Instituto Tecnológico de Morelia



Tuesday: Raju Prasad Ghimire, University of New Mexico

Wednesday: Hrushikesh Sahasrabuddhe, Indian Institute of Technology Mumbai

Amidst the COVID-19 Pandemic as Discussed at the Judson Symposium," in the February 2020 issue of *JOM*.

Young Professionals Offer Career Advice at Q&A Session

Six early-career professionals working in industry, government, and academia discussed how their interests and education led them to their current positions, how their jobs have been impacted by the pandemic, and what advice they'd offer to recent grads entering the workforce at the **Young Professional Q&A Session**, held as part of the student programming at MS&T20 Virtual.

Panelists offer advice at the Young Professional Q&A Session. Top row, from left: Liz Hunter, Nucor; Charmayne Lonergan, Pacific Northwest National Lab; Kelly Dallas, ArcelorMittal USA (moderator). Middle row, from left: Andrew Baker, Boeing; Scott McCormack, University of California, Davis; David Kober, IBA America. Bottom row: Abby Cisko, U.S. Army Engineer Research & Development Center.

"My key advice is network, network, network," said panelist **Scott McCormack**, University of California, Davis. "I think contacts are key at any stage—when you're looking for your first job but also when you're a CEO. From your network, you can gain new skills and mental support. Friends are a great place to turn during the tough times."

The past year presented new challenges for every workplace, the panelists acknowledged, but there were lessons to be learned there, as well.

"Prepare well because chaos is the time to thrive," said **Andrew Baker**, Boeing. "When everything's going right and your organization is doing well, there will be money to go around. But when something goes wrong and things are struggling, that's when you'll be able to fall back on all of those network connections that you've made. While things are going well, prepare well and establish those networks."

Building a network can be difficult, especially when you're first starting out, but the effort is worth it, the panelists agreed.

"Take the extra time to talk to people. Go to that dinner at a conference," said **Abby Cisko,** U.S. Army Engineer Research & Development Center. "Sometimes it's hard as an engineer or as an introvert. It's easy to slide into the background where you're comfortable but keep sending those e-mails and creating those connections."

Additional panelists included **Charmayne Lonergan,** Pacific Northwest National Laboratory; **Liz Hunter,** Nucor; and **David Kober,** IBA America.

Looking Ahead to MS&T21

Technical Meeting and Exhibition

MS&T21

MATERIALS SCIENCE & TECHNOLOGY

The MS&T partner societies are now looking forward to MS&T21, which is scheduled to be held October 17–21, in Columbus, Ohio. MS&T21 will feature the TMS Fall Meeting, a collection of symposia of interest to TMS members that explore the intersections of development, synthesis, and application.

Abstracts are now being accepted for a total of 75 symposia organized by the three sponsoring societies in 13 technical tracks, including:

- Additive Manufacturing
- Artificial Intelligence
- Biomaterials
- Ceramic and Glass Materials
- Electronic and Magnetic Materials
- Energy
- Fundamentals and Characterization
- Iron and Steel (Ferrous Alloys)
- Materials-Environment Interactions
- Modeling
- Nanomaterials
- Processing and Manufacturing
- Special Topics

Visit www.matscitech.org/MST21 to view a complete listing of planned symposia and to submit your abstract by March 15.

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Transitioning from an In-Person to Online Format Amidst the COVID-19 Pandemic as Discussed at the Judson Symposium

Assel Aitkaliyeva and Subhadra Gupta

Technical Meeting and Exhibition
MS&T20
MATERIALS SCIENCE & TECHNOLOGY


Assel Aitkaliyeva


Subhadra Gupta

Have you ever thought of attending **Curricular Innovations and Continuous Improvement of Academic Programs (and Satisfying ABET along the Way): The Elizabeth Judson Memorial Symposium** that is typically held at the Materials Science and Technology (MS&T) conference? If not, here is why you should!

The Elizabeth Judson Memorial Symposium was first held in 2011 to help academic engineering programs learn about ABET and prepare for ABET accreditation evaluation visits but has evolved over the past nine years to include other aspects of education. For example, in 2020 the Elizabeth Judson Memorial Symposium addressed multiple aspects critical to education: ABET, outreach and recruitment, admission, and laboratory experience. In addition, the workforce development team (led by Kester Clarke, Simona Murph, and Ashish Singh) from the TMS Education Committee discussed the pathways for identifying the strengths, weaknesses, and opportunities in undergraduate materials science and engineering (MSE) programs, which have been recently published in *JOM*.

(Editor's note: For more on this topic, read the October 2020 *JOM* article, "Workforce Development Survey Results: Industry, Government Laboratories, Academia, and Recent Graduates.")

Perhaps the most notable topics introduced in 2020 were: i) the Materials Genome Initiative (MGI) or the way universities are incorporating data science into curriculum and ii) remote and virtual instruction in response to the COVID-19 pandemic. Since none of us will forget 2020 any time soon, this article will focus on the changes we had to make to our education approaches because of the pandemic. After the first occurrence of COVID-19 cases in the U.S. and its rapid spread nationwide, U.S. universities started the transition from in-person classes to online formats. Some universities had three weeks to complete this transition and some just a few days. The transition has been challenging and put a strain on both faculty and the students. However, despite COVID-19, we found a way to navigate hands-on laboratory classes and formerly in-person courses, as can be evidenced from the examples provided below.

The University of California, Davis (UC Davis) converted a hands-on laboratory course on mechanical properties of materials to an online format in three weeks by adjusting the goals of the class. As noted by Susan Gentry, associate professor of materials science and engineering at UC Davis, laboratory skills were replaced with writing skills to compensate for the

inability to perform hands-on experiments, and students learned to write lab reports, conduct meaningful error analysis, and statistics. Furthermore, priority was given to the development of analytic skills such as statistical analyses and MATLAB, which aligns well with the MGI and incorporating data science into the curriculum. Success was attained by recording laboratory and data analysis sessions, utilizing remote demonstrations, and switching weekly laboratory classes to discussions guided by teaching assistants, in which topics alternated between writing and technical content.

Allen Kimel, associate professor from The Pennsylvania State University (Penn State), described COVID-19 as a facilitator for building greater skills in the industrial world that relies more on digital media. The experience of students in the junior design course (a prerequisite to senior design) at Penn State was enhanced by learning new skills during the transition to remote teaching. Students had an easier time adjusting to the teamwork component of the course as they quickly learned the value of teamwork and rated it highly in the course evaluation process. The external advisory board noted that the transition to an online format allowed students to practice and prepare for virtual meetings, and the white paper presentations were the most polished in the history of the class. Kimel says it is likely that virtual poster presentations will be used in the future as it is the future of presentations in global industry.

Ben Church, associate professor from the University of Wisconsin-Milwaukee, discussed the MSE capstone design and the impact COVID-19 had on the projects. The capstone design had to be re-scoped to adjust to new limitations and students were engaged in identifying limitations and the impact of the limitations on their projects. The inability to access laboratory equipment forced students to use digital image analysis and design plugins, which also aligns with the MGI and incorporating MGI into curriculum. Overall, restrictions from the COVID-19 pandemic taught students a valuable lesson and mimicked the limitations they will face in industry, thus providing students with an opportunity to learn from adversity.

"Overall, restrictions from the COVID-19 pandemic taught students a valuable lesson and mimicked the limitations they will face in industry, thus providing students with an opportunity to learn from adversity."

The Elizabeth Judson Memorial Symposium is held yearly at MS&T, and we do not just concentrate on Engineering Accreditation Commission (EAC) and ABET criteria, but also discuss topics most relevant to MSE programs across the U.S. As discussed in this article, MGI and remote and virtual instruction were two of the most relevant topics in 2020 and we cannot wait to see you at MS&T21. Getting involved in this symposium is easy and is not any different than submitting abstracts to any other symposium for a TMS annual meeting or MS&T! The abstracts for the 2021 Judson symposium are due on March 15, and we, the organizers, have a fantastic program lined up. All you need to do is submit the abstract online at www.programmaster.org/MST21. If you want to get involved in the symposium organization, e-mail one of the organizers (who are conveniently listed with their contact information on the symposium's ProgramMaster page), and we will be happy to talk you through the process. We are looking forward to seeing you at the next installment of the annual Curricular Innovations and Continuous Improvement of Academic Programs (and Satisfying ABET along the Way): The Elizabeth Judson Memorial Symposium.

Assel Aitkaliyeva is an assistant professor of nuclear engineering in the Department of Materials Science and Engineering at the University of Florida. Subhadra Gupta is a professor of metallurgy and materials engineering at the University of Alabama, Tuscaloosa. Both Aitkaliyeva and Gupta are members of the TMS Education Committee, and are Elizabeth Judson Memorial Symposium organizers for the 2020 and 2021 programs.

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JOM themagazine

TMS meeting headlines

Meeting dates and locations are current as of December 7, 2020.
For the most up-to-date list of TMS-sponsored events, visit www.tms.org/Meetings.

Other Meetings of Note

Solidification Course 2021
May 30–June 4, 2021
Villars-sur-Ollon, Switzerland

5th International Congress on 3D Materials Science (3DMS 2021)
June 29–July 2, 2021
Washington, D.C., USA

13th International Conference on the Technology of Plasticity (ICTP 2021)
July 25–30, 2021
Columbus, Ohio, USA

14th International Symposium on Superalloys (Superalloys 2021)
September 12–16, 2021
Seven Springs, Pennsylvania, USA

Liquid Metal Processing & Casting Conference (LMPC 2021)
September 19–22, 2021
Philadelphia, Pennsylvania, USA

Materials in Nuclear Energy Systems (MiNES 2021)
September 19–23, 2021
Pittsburgh, Pennsylvania, USA

TMS 2022 Annual Meeting & Exhibition (TMS2022)
February 27–March 3, 2022
Anaheim, California, USA

Additive Manufacturing Benchmarks 2022 (AM Bench 2022)
August 15–18, 2022
Bethesda, Maryland, USA

TMS2021
150th Annual Meeting & Exhibition

March 14–18, 2021
Registration Now Open!
www.tms.org/TMS2021

- The TMS 2021 Annual Meeting & Exhibition (TMS2021) celebrates 150 years of bringing together engineers, scientists, business leaders, and other professionals in the minerals, metals, and materials fields for a comprehensive, cross-disciplinary exchange of technical knowledge.
- Plans for this year's meeting include more than 85 symposia planned in 13 topic areas.
- An All-Conference Plenary session features Anne Lauvergeon, founder/CEO of ALP, chair of École des Mines de Nancy, and former CEO of Areva SA.
- The Fifth International Symposium on Nickel and Cobalt (Ni-Co 2021) will run in tandem with TMS2021. Visit the TMS2021 website for information on registration, programming, and more.

Mg 2021
12th International Conference on Magnesium Alloys and their Applications

June 15–18, 2021
Virtual Event
Discount Registration Deadline: April 30, 2021
www.tms.org/Mg2021

- **New format!** The 12th International Conference on Magnesium Alloys and their Applications (Mg 2021) is a fully virtual event. The conference will cover the full breadth of magnesium R&D, from primary production to applications to end-of-life management. Scientists and engineers from academia, government, and industry will discuss new developments in magnesium alloys and share valuable insights. Register by April 30 for the best rate.

MS&T21
MATERIALS SCIENCE & TECHNOLOGY

October 17–21, 2021
Columbus, Ohio, USA
Abstract Deadline: March 15, 2021
www.matscitech.org/MST21

- Abstracts are being accepted now on topics including additive manufacturing, artificial intelligence, biomaterials, ceramic and glass materials, electronic and magnetic materials, energy, fundamentals and characterization, iron and steel, materials-environment interactions, modeling, nanomaterials, processing and manufacturing, and others.
- Visit the conference website to sign up for updates on the technical program, short courses, and special events in minerals, metals, ceramics, and glass.

TMS ICME
MANUFACTURING · DESIGN · MATERIALS

November 14–18, 2021
Hyatt Regency Lake Tahoe
Lake Tahoe, Nevada, USA
www.tms.org/ICME2021

- **Date change!** Organizers of the 6th World Congress on Integrated Computational Materials Engineering (ICME 2021) rescheduled the meeting to November 2021. A call for abstracts has reopened—visit the website for technical program details.
- Plenary speakers will include Bita Ghaffari, Ford Motor Company; Andrea Rovinelli, Argonne National Laboratory; Peter Voorhees, Northwestern University; and Charles H. Ward, Air Force Research Laboratory, among others.
- Enjoy the best rates by signing up now for registration and housing at the Hyatt Regency Lake Tahoe, a waterfront resort in the Sierra Nevada mountains.

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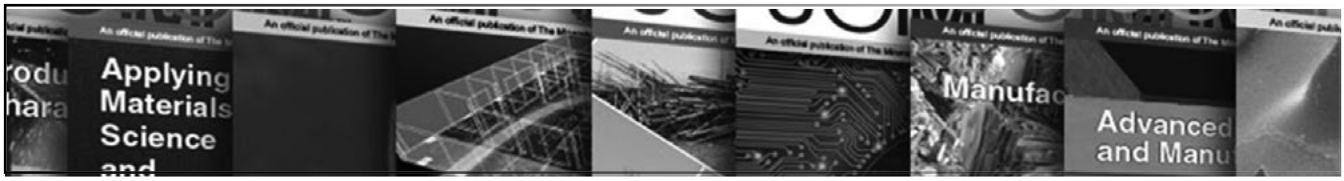
https://doi.org/10.1007/s11837-020-04544-3

call for papers

JOM **is seeking contributions on the following topics for 2021. For the full Editorial Calendar, along with author instructions, visit www.tms.org/EditorialCalendar.**



August 2021
Manuscript Deadline: March 1, 2021

Topic: Additive Manufacturing: Functionally Graded Alloys

Scope: Functionally graded metals, or "gradient alloys," have the potential to add a completely new dimension to metal additive manufacturing by allowing the composition of near-net-shaped parts to be strategically controlled. Successful demonstrations of applications, challenges, and paths forward for the research area are reflected. Emerging metal additive manufacturing technologies that are more conducive to functionally grading metals can be discussed, along with comments about the intersection between metal printing and metal coating.
Editors: Somayeh Pasebani and Tom Stockman
Sponsor: Additive Manufacturing Committee

Topic: Defect and Phase Transformation Pathway Engineering for Desired Microstructures

Scope: Extended defects such as dislocations and internal interfaces have been frequently utilized to tune desired phases and optimize mechanical properties. This special topic aims to publish research that brings together state-of-the-art characterization tools and computational tools for the fundamental understanding of defect-microstructure interactions and the corresponding defect engineering strategies to design new microstructures, both homogeneous and heterogeneous / hierarchical for unprecedented properties.
Editors: Yufeng Zheng, Rongpei Shi, and Rajarshi Banerjee
Sponsor: Phase Transformations Committee

Topic: Multiscale Methods for Design of High Performance Coatings

Scope: This topic emphasizes new results in the development and application of multiscale techniques (both experimental and computational) toward the design of high-performance coatings. Particular applications of interest include thermal barrier coatings, wear coatings, and coatings for extreme environments.
Editors: William J. Joost, R. Wesley Jackson, Mark Carroll, and Pantcho Stoyanov
Sponsor: ICME Committee

September 2021
Manuscript Deadline: April 1, 2021

Topic: Computational Modeling in Pyrometallurgy

Scope: Pyrometallurgical furnace operations are typically very complex in nature and may involve tightly coupled interactions between phenomena from heat transfer, fluid flow, electromagnetics, thermochemistry, phase change, granular media, and more. Exacerbating the difficulties in understanding such phenomena are the extraordinary challenges inherent in performing measurements on pyrometallurgical processes (e.g., extreme conditions limit direct measurements). This topic will aim to cover a variety of contemporary applications of computational modeling in pyrometallurgical science and engineering.
Editors: Quinn Reynolds and M. Akbar Rhamdhani
Sponsor: Pyrometallurgy Committee

Topic: Recovery, Sorting, and Processing of Secondary Aluminum

Scope: This topic covers recycling of aluminum and its alloys, with a specific focus on managing recovery, sorting, and processing for secondary aluminum production. This may include advances in sorting technologies, pre-treatment steps, and various re-melting techniques together with, or in addition to, recovery of by-products from these techniques. Also, holistic approaches for secondary aluminum production are welcomed.
Editor: Anne Kvithyld
Sponsors: Aluminum Committee and Recycling and Environmental Technologies Committee

October 2021
Manuscript Deadline: May 1, 2021

Topic: Corrosion in Heavy Liquid Metals for Energy Systems

Scope: This topic invites papers on studies related to heavy liquid metal (HLM) such as Pb and lead bismuth eutectic compatibility with structural materials including corrosion and liquid metal embrittlement. In addition, technological aspects of HLM technology including chemistry control methods, filtering, in-situ characterization techniques, forced and natural convection methods, and flow measurements are also included in this topic.
Editors: Osman Anderoglu, Alessandro Marino, and Peter Hosemann
Sponsors: Corrosion and Environmental Effects Committee and Nuclear Materials Committee

Topic: Informatics-Enabled Design of Structural Materials

Scope: Informatics-enabled design is a paradigm shift for materials engineering, and has led to many breakthroughs within the last decade. For structural materials, an array of challenges persist due to the need for quantitative evaluation of competing performance metrics across many time and length-scales. This special topic aims at capturing the needs and limitations of informatics toolsets for design of structural materials. We invite articles that highlight recent advances and set the scope for future.
Editors: Jennifer L.W. Carter and Amit K. Verma
Sponsor: Mechanical Behavior of Materials Committee

Topic: Materials for Small Nuclear Reactors and Micro Reactors, including Space Reactors

Scope: Small nuclear reactors, including micro-reactors, small modular reactors, space reactors, and off-grid reactors rely on different materials and manufacturing processes than those in large-scale power plants: molten salts as coolants and fuels, heat-pipes for heat removal, metal hydrides as high-temperature moderators, fuels for higher burnup and accident tolerance etc. They also require novel structural materials and understanding of material interactions. This special topic focuses on materials research and experimental and modeling/simulation for small nuclear reactors.
Editors: Sven C. Vogel, Raluca O. Scarlat, Aditya P. Shivprasad, and Marisa Monreal
Sponsor: Nuclear Materials Committee

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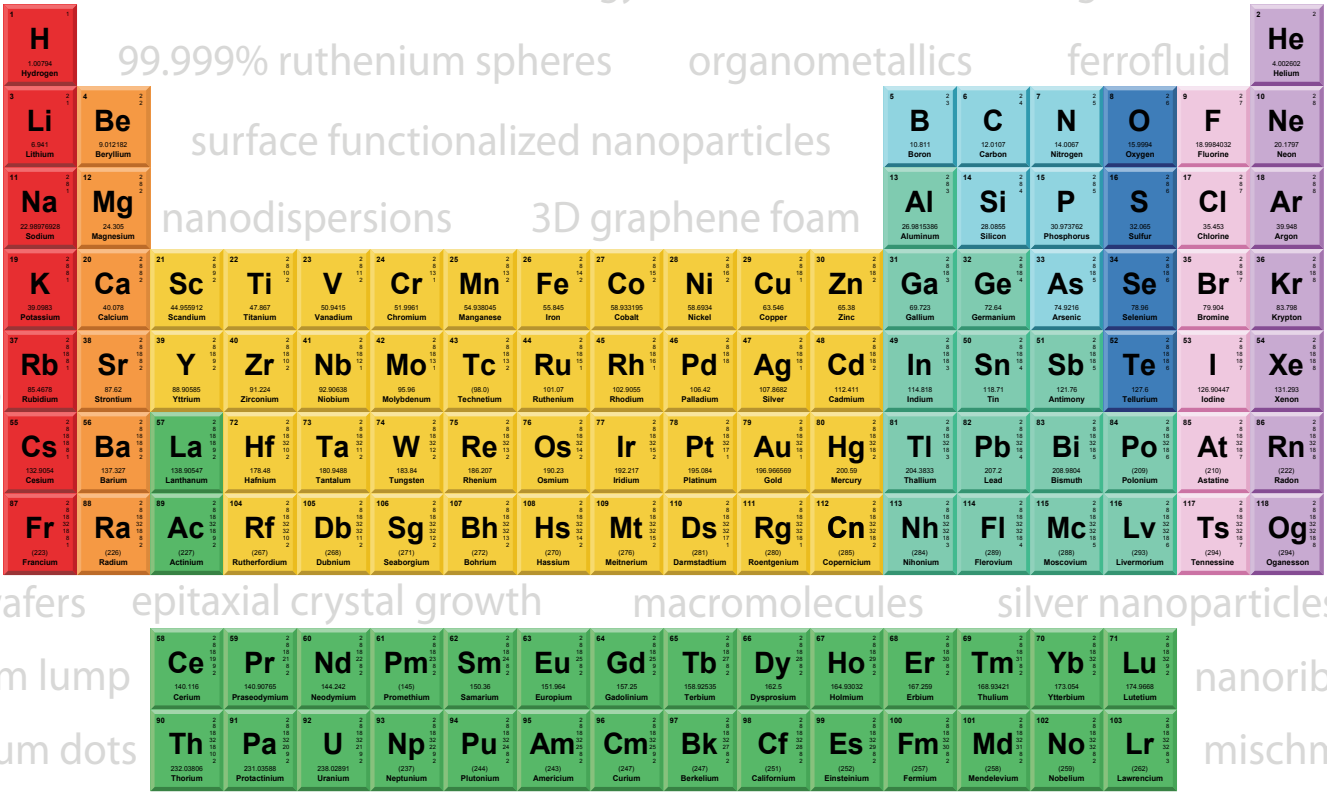

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