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Structural Materials Division JOM Best Paper Award

"Effect of TiN-Particles on Fracture of Press-Hardened Steel Sheets and Components,"

J.C. Pang, H.L. Yi, Q. Lu, C.M. Enloe, and J.F. Wang 71, 1329–1337 (2019) doi: 10.1007/s11837-018-3308-z



Light Metals Division JOM Best Paper Award

"Al₈Mn₅ Particle Settling and Interactions with Oxide Films in Liquid AZ91 Magnesium Alloys,"

L. Peng, G. Zeng, T.C. Su, H. Yasuda, K. Nogita, and C.M. Gourlay

71, 2235–2244 (2019) doi: 10.1007/s11837-019-03471-2



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About the Cover

From "Optimal Design for Metal Additive Manufacturing an Integrated Computational Materials Engineering (ICME) Approach" by S. Amir H. Motaman et al., the figure illustrates the local strain distribution in an additively manufactured lattice structure simulated by a finite-element-method (FEM) model. The results of this simulation allow for evaluation of local strain distribution and energy-absorption capacity under service conditions. Within the multi-scale and multi-physics ICME approach presented by authors, the FEM simulation is utilized as an effective computational tool to predict and explore the structural performance of additively manufactured metallic components.

March 2020 Guest Editors

The 2nd Asia-Pacific International Conference on Additive Manufacturing (APICAM 2019) Invited

Ma Qian, University of Queensland

Additive Manufacturing: Validation and Control

Additive Manufacturing Committee Judy Schneider, University of Alabama at Huntsville

Advanced Manufacturing for Biomaterials and Biological Materials: Part I

Biomaterials Committee Hannes C. Schniepp, The College of William and Mary Steven Eric Naleway, University of Utah Vinoy Thomas, University of Alabama at Birmingham David Restrepo, University of Texas at San Antonio



Advances in Characterization of Powder Materials

Materials Characterization Committee Zhiwei Peng, Central South University Yunus Eren Kalay, Middle East Technical University Rajiv Soman, Eurofins EAG Materials Science LLC

Solid Freeform Fabrication 2019 Invited David Bourell, University of Texas

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.

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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.

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in the final analysis

"Our latest report shows the continued spread of S&E capacity across the globe, which is good for humanity because science is not a zero-sum game. However, it also means that where once the U.S. was the uncontested leader in S&E, we now are playing a less dominant role in many areas."

- National Science Board Chair Diane Souvaine

Every two years, the National Science Board and the National Science Foundation issue *The State of U.S. Science and Engineering.* The report is submitted to the U.S. President and U.S. Congress, presumably to help all parties be wiser and better educated in their deliberations and decision-making. The program's origins trace back to 1863 during the U.S. Civil War, so notch another moment of exceptionalism from the remarkable presidency of Abraham Lincoln. And lest we forget, Lincoln signed into law the legislation establishing the National Academy of Sciences during the same year.

More that 150 years later, the 2020 report is concisely written and employs plentiful graphs to describe trends in U.S. science and engineering and show how it is positioned in relation to other countries. The report is divided into six topical areas. I'll spare you my "clever" summarizations and instead give you a few direct quotes from the summaries of each:

- *Global Education:* "U.S. eighth graders rank in the middle of advanced economies in international mathematics and science assessments, and U.S. national assessments of mathematics show little to no growth in scores over the past decade. The United States awards the most S&E doctoral degrees of any single country and receives the largest number of internationally mobile students."
- Science and Engineering Workforce: "Workers employing S&E and technological expertise in their occupations experience better labor market outcomes than those in many other types of jobs. Women and certain racial and ethnic groups—blacks, Hispanics, and American Indians or Alaska Natives—are underrepresented in S&E. However, their total numbers in S&E occupations have increased. Foreign-born individuals account for a considerable share of S&E employment, particularly among workers with graduate degrees."
- *Global R&D:* "The United States spent more on R&D than did any other country in 2017. However, its global share since 2000 fell as R&D spending rose in many Asian countries, especially China."
- *R&D Performance and Funding:* "Businesses perform and fund most of the overall R&D in the United States as well as most of the applied research and experimental development. Higher education is the second-largest performer of R&D and performs the largest share of basic research; the federal government is the second-largest funder of R&D and funds the largest share of basic research."
- *Global Science and Technology Capabilities:* "The 28 nations that make up the EU collectively have the highest output of S&E publications globally. China's S&E publication output ranks next, followed by the United States. The citation impact of China's publications is rising rapidly."
- *Invention, Innovation, and Perceptions of Science:* "Inventors from China, Japan, and South Korea receive the majority of patents for unique inventions across all countries and regions, based on patent family statistics. Engineering-related inventions made up more than half of all these global patent families in 2018....Overall, Americans view S&T positively. Most Americans believe that science creates more opportunities for the next generation and that the federal government should provide funds for scientific research. However, a considerable share also think that science makes life change too fast."

I suspect that whether the speed of change is too fast or too slow likely has a lot to do with the location of the observer, and as the report makes clear, the locations of those observers is undergoing considerable change.



Number 3

March 2020



James J. Robinson Executive Director

<u> @JJRofTMS</u>



Science and Engineering Indicators 2020: The State of U.S. Science and Engineering. Image credit: P. Roushan\Martinis lab\UC Santa Barbara.

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Journal of Sustainable Metallurgy Welcomes New Editor; TMS Renames Award

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.

Morita Named Journal Co-Editor-in-Chief

Journal of Sustainable Metallurgy



Correction

JOM staff apologizes for the misspelling of **Petra Maier's** name in the February 2020 article, "A Mark of Excellence: The 2020 TMS Award Recipients." Maier is a recipient of the 2020 Light Metals Division Magnesium Technology Best Paper Award – Application. Kazuki Morita, professor at The University of Tokyo, has joined Bart

Blanpain, KU Leuven, and Uday Pal, Boston University, as co-editor-in-chief of the *Journal* of Sustainable Metallurgy. He replaces founding co-editor-inchief Shin-ya Kitamura, Tohoku University, who retired at the end of 2019 after five years of service.

Morita's research interests include high-temperature physical chemistry, extractive metallurgy, chemical equilibrium, isotope exchange, and environmental engineering. His Materials Production and

Recycling Engineering Lab is working toward establishing an environmentally friendly society by developing their production and recycling processes of elementary materials, such as steel and silicon, together with by-product treatment. at The University of Tokyo, Morita previously served as the head of the Department of Materials Engineering and as both the deputy director and director of the International Research Center for Sustainable Materials— Institute of Industrial Science. Morita is also currently a guest professor at Kinming University of Science and Technology and Sichuan University, and a visiting professor at Akita University. He has been a TMS member for more than 20 years.

The Journal of Sustainable Metallurgy is a quarterly publication dedicated to presenting metallurgical processes and related research aimed at improving the sustainability of metalproducing industries, with an emphasis on materials recovery, reuse, and recycling. The journal has been accepted for indexing and will get its first Impact Factor in 2020. TMS members can log in at www.tms.org/Journals to begin reading for free, and to learn how to submit a paper for an upcoming issue.

In addition to his faculty position

TMS Updates Name of Society Award

At its December 2019 meeting, the TMS Board of Directors approved a proposal to change the name of the Application to Practice Award to the **Research to Industrial Practice Award**, beginning with the 2021 award.

The intent of the award is still to recognize an individual who has demonstrated outstanding achievement in transferring research results or findings into commercial production and practical use. By changing the name, the award will now align more closely with its purpose: offering an award that specifically recognizes industrial achievement will demonstrate the value of industry and commercial accomplishments in materials science and engineering. The selection criteria for the award also remain the same.

To apply for the newly named honor, completed nomination forms and accompanying materials should be submitted by **April 1, 2020**, to awards@tms.org. More details on preparing a nomination packet can be found at awards.tms.org.

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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.

In Case You Missed It: Business News from the Field

Industry Giants Forge Essar Steel's Future Luxembourg City, Luxembourg:

ArcelorMittal SA, the world's largest steelmaker, completed the acquisition of debt-ridden Essar Steel India Ltd., a carbon-steel manufacturer headquartered in Mumbai. The transaction marked the end of Essar's corporate insolvency resolution process that lasted more than 800 days. Essar Steel is now jointly owned and operated by ArcelorMittal and Nippon Steel Corporation, the world's third largest steel producer, with ArcelorMittal holding 60% of the venture. ArcelorMittal had been seeking to expand in India for over a decade.

Fura Gems Acquires Australian Mine

Toronto, Canada: Fura Gems Inc. purchased the Capricorn sapphire project in Queensland, Australia, from Richland Resources Ltd. for U.S. \$1.25 million. The project includes two mining permits and three mining licenses. The acquisition makes Fura the only public gemstone mining and marketing company in the world to hold assets in all three colored



gemstones: emerald, ruby, and sapphire. Fura is also in the process of adding ruby prospecting licenses and concessions in Mozambique.

High Point, North Carolina, USA: Amada America completed the build out of a new sheet metal manufacturing facility in High Point, North Carolina. The new construction stretches more than 261,700 square feet to include a manufacturing facility, a technical building, and administrative offices, and will generate approximately 200 jobs in the region. The first products to be assembled are Amada's HRB series of press brakes and automation systems. (Rendering courtesy of Gray Construction.)

Solar Cell Growth Surprises Materials Scientists

Golden, Colorado, USA: Scientists at the National Renewable Energy Laboratory (NREL) achieved a technological breakthrough for III-V solar cells by demonstrating growth using a common technique that had yet to succeed for those compounds. The scientists successfully integrated an aluminum source into their hydride vapor phase epitaxy (HVPE) reactor, then grew the semiconductors aluminum indium phosphide (AlInP) and aluminum gallium indium phosphide (AlGaInP) for the first time by this technique. These efforts seek to reduce the high cost of III-V solar cells, which are commonly used for space applications.

Bentley Eyes Solid-State Batteries to Power EVs

Crewe, United Kingdom: Luxury carmaker Bentley Motors Ltd. is looking to use solid-state batteries for its electric vehicles (EVs) instead of the current lithium-ion batteries used in the majority of EVs. Bentley estimates its first fully battery-electric vehicle to arrive in 2025. Solid-state batteries offer the advantages of being smaller, more lightweight, and less flammable. Other automakers working on solid-state batteries include Ford, BMW, and Hyundai.

McDermott Files for Bankruptcy

Houston, Texas, USA: McDermott International Inc. filed for protection under Chapter 11 of the U.S. Bankruptcy Code in January. The engineering company that builds oil platforms and gas-export plants for energy firms plans to restructure its operations with the help of creditors. By reorganizing and generating cash from operations, McDermott aims to return to normal and strengthen its position in the long run. After considering the sale of Lummus Technology, its business licensing proprietary petrochemical technology, McDermott agreed to enter into a joint partnership with The Chatterjee Group and Rhône Group to divest Lummus Technology for \$2.73 billion.

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A Simple Plan Revisited:

James C. Foley



James C. Foley

"...more and more people are recognizing the value of presenting at and attending TMS meetings." —James C. Foley Editor's Note: James Foley completed his term as TMS President at the TMS 2020 Annual Meeting & Exhibition, February 23–27, 2020, in San Diego, California. *JOM* invited him to reflect on his experiences as president, as well as his hopes for the future of TMS.

When I began my tenure as TMS President, we had just announced a new strategic plan for the Society—TMS Aspires—which painted a picture of what our ideal professional community would look like. At the same time, I announced some aspirations of my own: a simple, five-step plan for a successful year. Let's see how we did on both fronts.

First, from a Society-wide perspective, the TMS Aspires plan consisted of three overarching goals.

Goal 1: TMS aspires to be a highly inclusive society where all materials students and professionals feel welcome and diversity is celebrated.

One example of how we worked toward this goal was attending the STEM Inclusion Study Best Practices Workshop in Washington, D.C., last summer. This workshop was based on the results of the



2019 TMS President James Foley Talks With JOM

2018 STEM Inclusion Study, funded by the National Science Foundation (NSF). I, along with several other representatives from TMS and 15 or so additional science and engineering organizations, spent a day discussing and brainstorming how we can all better promote equality and inclusion among the STEM communities represented by our memberships. TMS was the only materials professional society that participated in this groundbreaking assessment of diverse groups in the STEM workplace, and many of the ideas they discussed are now being explored and developed more fully through the TMS Diversity Committee.

Goal 2: TMS aspires to be the place where global materials practitioners come together and participate in vibrant annual meetings, specialty conferences, courses, student activities, and other events.

We made great strides on this front, both with some of our bigger conferences and our smaller specialty meetings. The TMS 2020 Annual Meeting & Exhibition (TMS2020) attracted a record number of abstracts—surpassing 5,000 abstract submissions for the first time in TMS history—while our upcoming fall meeting, Materials Science & Technology 2020

Foley presented Kevin Hemker, right, with a gift for his service as 2018 TMS President during TMS2019, when Foley officially began his presidential term.

A Simple Plan Revisited: 2019 TMS President James Foley Talks With JOM

(MS&T20), will be hosting roughly 100 symposia—a 10% increase over previous years. And I know that bigger doesn't always mean better, but in this case, it does mean that more and more people are recognizing the value of presenting at and attending TMS meetings.

In addition, we moved forward with several collaborations with partnering societies. This included participating in the first Materials in Nuclear Energy Systems (MiNES) conference, which was hosted by the American Nuclear Society in 2019 and will be hosted by TMS in 2021, and signing a new agreement with the Association for Iron & Steel Technology to jointly plan the 2021 Austenite Formation and Decomposition Conference. TMS is also a lead organizing society for the inaugural Congress on Safety in Engineering and Industry 2020, which brings together the perspectives and talents of seven leading engineering societies and the National Academies, with support from the United Engineering Foundation.

Goal 3: TMS aspires to be the society that envisions, defines, and enables the future by gathering and empowering materials experts to scope the future of materials science, engineering, and technology.

In 2019, we introduced *three* new studies. Two of them, *Metamorphic Manufacturing: Shaping the Future of On-Demand Components* and *Verification and Validation of Computational Models Associated with the Mechanics of Materials* were available in March in time for the TMS 2019 Annual Meeting & Exhibition, while the third, *Creating the Next-Generation Materials Genome Initiative Workforce*, was released in December.

The newest TMS study team is currently working on Accelerating the Broad Implementation of Verification and Validation in Computational Models of the Mechanics of Materials and/or Structures, supported by the NSF and set to be released in August 2020. TMS is really becoming a leader in developing these influential technology studies and getting them into the hands of people who can use them.



Past, present, and future: TMS leaders gathered together at MS&T19 in October 2019 in Portland, Oregon. From left to right: Tom Battle, 2020 TMS President; Jim Robinson, TMS Executive Director; Foley, 2019 TMS President; and George T. "Rusty" Gray, 2010 TMS President.

That's just a quick look at some of the ways the year stacked up to our aspirational goals as a Society. Now here's how my own personal plan measured up. In my speech last year as incoming president, I promised to do five things—and I encouraged all of you to adapt this simple, five-step plan for your own use:

- Volunteer my time.
- Nominate people for awards and positions.
- Donate to the TMS Foundation.
- Promote TMS.
- And encourage others to do the same.

Volunteering my time was easy enough. There were plenty of Presidential duties to keep me busy throughout the year!

As TMS president, I had plenty of opportunities to promote TMS and encourage others to do the same. My travels as an ambassador for TMS took me to Sweden for the Federation of European Materials Societies' EUROMAT conference, which featured programming organized by TMS; to Dallas for a Board of Trustees meeting of American Institute of Mining, "TMS is really becoming a leader in developing these influential technology studies and getting them into the hands of people who can use them." —James C. Foley



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"No matter what form it takes. I'd encourage each and every one of you to continue making contributions, in your own way, according to your own plan, in the coming year." —James C. Foley

Metallurgical, and Petroleum Engineers (AIME); to Portland for MS&T19; and to Washington D.C. for a congressional briefing on Metamorphic Manufacturing, to name a few. I've definitely checked those two boxes.

On a personal level, I was able to nominate deserving individuals for several awards and leadership positions within TMS, which is something that is very important to me. But I also got to see the introduction of three new awards, the first recipients of which were honored at the TMS2020 Awards Ceremony in February. These were:

Frontiers of Materials Award

Young Innovator in the **Materials Science of** Additive Manufacturing Award

• William D. Nix Award

None of these awards would be possible without the support of the TMS Foundation, and yes, I made my contribution this year. Hopefully, many of you did the same. A significant



During his year as president, Foley traveled to TMS headquarters in Pittsburgh, Pennsylvania, in July 2019 along with the rest of the Board of Directors for its annual summer retreat. Pictured, from left to right, is: Cindy Belt, Extraction & Processing Division Chair; Raymundo Arroyave, Functional Materials Division; Alexis Lewis, Membership & Student Development Director; John Howarter, Public & Governmental Affairs Director; Kevin Hemker, 2018 TMS President; Brad Boyce, Programming Director; James C. Foley, 2019 TMS President; Jim Robinson, TMS Secretary/Executive Director; Mark Stoudt, Materials Processing & Manufacturing Division Chair; and Michele Manuel, Content Development & Dissemination Director.



What's your word? Foley used "community" to describe TMS membership in one word during a stop at the TMS Member Lounge at MS&T19 in October 2019.

undertaking for the Foundation in 2019 was redesigning its website, refreshing its brand, and more specifically highlighting its strategic focus. If you haven't already, please check out www.TMSFoundation .org to learn more about how the Foundation supports students and young professionals in our field, including awards like the ones that I previously mentioned.

All in all, I think the Society and I both did a pretty good job of making good on our promises. And I'm sure that most of you will find, if you look back over the past year, that you've contributed in some way, too, to advancing our Society and our profession.

Maybe you promoted a deserving colleague with an award nomination. Maybe you donated to the future of our profession through the TMS Foundation. Maybe you shared important research at one of our conferences or through one of our journals.

No matter what form it takes, I'd encourage each and every one of you to continue making contributions, in your own way, according to your own plan, in the coming year. I know I will.



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Building on Discovery: A Preview of 3DMS 2020

Dorte Juul Jensen, Matthew P. Miller, and Lei Zhang

The International Congress on 3D Materials Science (3DMS 2020) will meet for its milestone fifth iteration on June 28–July 1, 2020, in Washington, D.C. This renowned conference has helped to steadily advance 3D materials science and method development since it was first held in 2012. This summer, the meeting promises to build upon its eight years of discoveries and increase a burgeoning network of researchers and practitioners who are examining 3D microstructures of materials and are developing associated technologies and methods.

Contributions of 3DMS to the Field

The field has greatly advanced since the congress first met. By now, it is widely accepted that 3D characterization is generally needed as 2D methods may lead to insufficient and even misleading information. Several 3D methods and the associated data analysis tools have matured and are user-friendly. Various material properties can be predicted in terms of digitalized real 3D structure of materials by combining simulation and different constitutive relations. It is also shown that 3D data obtained by nondestructive methods, often using in situ capabilities at various sample conditions (for example at different times during annealing or plasticity), are becoming essential as input to and validation of various simulation tools.

These advancements will continue through discussions at 3DMS 2020. Topics will span 3D characterization, visualization, quantitative analysis, modeling, and development of structure-property relationships, along with the associated issues of big data and machine learning.

Highlights of 3DMS 2020

The planned technical sessions have been designed to showcase the broad work that researchers are doing to develop new techniques, technologies, and models. Plenary talks will feature three experts: Jaafar El-Awady, Johns Hopkins University, with "Acoustic Emission Measurements of Damage Accumulation and Crack Initiation in Metals at the Micron-scale;" Satoshi Hata, Kyushu University, with "Toward Dynamic 3D Visualization of Dislocations by Electron Tomography;" and Helena Van Swygenhoven, Paul Scherrer Institute and Swiss Federal Institute of Technology Lausanne, with "Operando and In Situ Synchrotron Experiments Following Microstructural Evolutions." The technical program also highlights invited speakers from China, Denmark, France, Germany, Japan, and the U.S.

Attendees will find tremendous value in making new acquaintances and reconnecting with other scientists, researchers, and engineers interested in 3D materials science and 3D method development. We expect more than 180 attendees at 3DMS 2020, so the potential to establish new collaborations is great. Every two years, the congress inspires materials researchers to create and implement 3D methods and thereby grow an international community.

What sets 3DMS 2020 apart from other similar meetings is its focus on characterization. Within all areas of the materials science field, the possibility to do characterization in 3D is a very important step forward. At 3DMS 2020, advanced 3D characterization tools with better spatial and temporal resolutions and new mathematical tools will be presented. An emphasis is placed on simulation of material behavior during processing or performance conditions. This The 5th International Congress on



3D Materials Science 2020 Register Now for 3DMS 2020

June 28–July 1, 2020 Hyatt Regency Washington on Capitol Hill, Washington, D.C., USA

Increase your knowledge about the latest advances in 3D materials science while expanding your connections in this quickly evolving field. For cost-savings, register by the discount deadline of May 18. Note that the housing deadline to book the group rate at the Hyatt is June 5. Don't miss it reserve your spot today. Visit www.tms.org/3DMS2020 for additional information and to register. area is undergoing a drastic evolution; powered by 3D characterization data, material models are being used for the first time to actually predict properties and performance, including the lifetimes of real industrial materials. An emerging capability is obtaining 3D characterization data dynamically during processes related to additive manufacturing. Machine learning and other data science methodologies will greatly enhance our ability to examine, digest, and understand these incredibly rich data sets in ways that can be most useful to process and, ultimately, to product design.

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The Value of 3DMS 2020



Dorte Juul Jensen



Lei Zhang



Matthew P. Miller

Dorte Juul Jensen, Technical University of Denmark: "For me, the 3DMS congress series is outstanding and a *must* to attend, as it is the cornerstone in building a new community within materials science. This community has grown significantly over the years, and it is enlightening that such a broad and cross-disciplinary 'team' has built up. Without the various skills, we would never have been able to move materials science to 3D."

Lei Zhang, Chinese Academy of Sciences: "From my personal point of view, the 3DMS congresses give me a good opportunity to meet worldwide colleagues who have common interests in promoting the application of 3D techniques and methodology in materials science research."

Matthew P. Miller, Cornell University and Cornell High Energy Synchrotron Source: "The most exciting thing for me about 3DMS is watching how many of the early 3D *experiments*—often conducted on model materials—have become reliable 3D material *measurements*, capable of quantifying the evolving microstructure of real materials in some of the most important and challenging **real** applications a material can face. In the eight years of 3DMS, the science has shifted from the characterization probe to the *material* itself."

The Continuing Impact of 3DMS

Looking forward, it will be important to focus our work on the full 3D information. It is an emerging trend that machine learning can boost simulations with abundant big data produced by the digitalized model of real materials with 3D overall configuration of phases, grains, internal defects, composite structures, etc. Only by using the full 3D information, a correct image can be obtained.

The applications of 3D are increasingly covering all aspects, from basic bluesky research to practical industrial applications. We consider it of importance to advance the ongoing research with a 3D focus but also to apply the methods even more broadly. We expect to see more 3D tools being developed for use in the home laboratories to supplement the more advanced experiments at large international facilities. Altogether, this will contribute to improving simulation tools and predictive capabilities in the advancement of existing materials and in the development of new materials and manufacturing routes, including additive manufacturing. Finally, it will be fascinating to discover the potential of the most advanced tools, such as incorporating machine learning and deep learning technologies.

Since the congress was established, 3DMS has been essential to addressing some critical problems in the 3D space. Advancements will continue through the fifth iteration and future iterations as the community grows and encourages technology advancements and research collaborations.

Dorte Juul Jensen is a professor at the Technical University of Denmark; Matthew Miller is an engineering professor at Cornell University and associate director of the Cornell High Energy Synchrotron Source; and Lei Zhang is a professor at the Shenyang National Laboratory for Materials Science, Chinese Academy of Sciences. Juul Jensen is the chair of the 3DMS 2020 organizing committee, with Miller and

Zhang both also serving as

congress organizers.

JOIM themagazine

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young professional technical notes

This occasional feature highlights the scientific interests and professional accomplishments of a young TMS member who has contributed to the technical content of the current issue of JOM as an author, advisor, or quest editor. The development of this feature is a special project of the TMS Young Professionals Committee, For additional information contact Kaitlin Calva, JOM Magazine Managing Editor, at kcalva@tms.org.

At the Forefront of Nuclear Materials Science with Assel Aitkaliyeva

Kaitlin Calva

"The beauty of nuclear materials science is that the challenges are numerous, but you get to stay at the forefront of science," said Assel Aitkaliyeva, assistant professor in the Department of Materials Science and Engineering at the University of Florida (UF), and co-author of the January 2020 *JOM* paper, "Towards Bridging the Experimental Length-Scale Gap for Tensile Tests on Structural Materials: Lessons Learned from an Initial Assessment of Micro-tensile Tests and Path Forward." "And I get to destroy materials for a living in a creative way!" she added.

Aitkaliyeva began her undergraduate studies at Kazakh State University in nuclear physics, switching to nuclear engineering for her M.S. and Ph.D. at Texas A&M University. "While working on my master's degree, I discovered that I was passionate about the materials science aspect of the nuclear industry. My earlier exposure to physics and engineering provided me with a unique perspective and I wanted to know how any given material does in a harsh environment."

After earning her Ph.D. and working in postdoctoral and staff positions at Idaho National Laboratory, she joined UF and formed the MAterials for Nuclear Advancement and Technology in Extreme Environments (MANATEE) group. "Our

Assel Aitkaliyeva (left) works in the Nuclear Fuels and Materials Characterization Facility at UF with her student Tanvi Ajantiwalay (center), lead author on the January JOM paper, and Nick Rudawski (right), support staff.



primary research pillars are nuclear fuels, irradiation damage in structural materials and waste storage media, and defect engineering in low-dimensional materials," she said. "The *JOM* paper highlights just one part of our research—small-scale mechanical testing and its implementation in the nuclear field. Out of the small-scale mechanical tests, micro-tensile tests are the easiest to analyze, data-wise, and we evaluate the suitability of this approach for testing nuclear materials. This is the first step of our journey, and we are excited to expand the technique to nuclear fuels."

When reflecting back on her career and education, Aitkaliyeva expressed her gratitude for the many mentors who piqued her interest in science. "My M.S. and Ph.D. advisor Lin Shao encouraged me to strive for excellence," she said, noting that it was Shao's support of her choosing her own projects that led her to her work today. Instead of continuing with work that did not interest her, Aitkaliyeva saw an opportunity to move to something more compellingtesting the stability of one-dimensional materials. "Carbon nanotubes fascinated me then," she said. "My interest in carbonbased materials was sparked by Mildred Dresselhaus, the 'queen of carbon science.' I got to meet her at several conferences, and she was (and still is, despite her passing) an example for me."

Beyond her mentors, Aitkaliyeva also recognized the impact that being a TMS member has had on her career. "It provided me with networking opportunities while expanding my knowledge base. Since TMS spans a wide range of topics, it never fails to educate you on all aspects of materials science and allows you to look at any problem from multiple points of view," she said. To young scientists and engineers just starting out in the field, Aitkaliyeva advised: "Don't be afraid to step outside of your comfort zone! Get engaged with a professional society and network. Your research will benefit from it."

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All TMS Young Professional Awards are meant to highlight early career individuals at a critical stage in their careers and provide them with the necessary recognition, professional development, and networking opportunities to continue their growth as members of the minerals, metals, and materials community.

In the case of the TMS Young Leaders Professional Development Awards, each of the Society's five technical divisions selects recipients based on their exceptional promise as materials science and engineering professionals. Awardees receive financial assistance to attend the TMS Annual Meeting & Exhibition where they serve as judges for student events and attend committee, division council, and TMS Board of Directors meetings. As a result, recipients gain first-hand experience with the Society's many voluntary leadership roles while networking with prominent TMS members and community leaders.

New in 2020 is the TMS Young Innovator in the Materials Science of Additive Manufacturing Award. The award recognizes an outstanding, early career individual who is performing innovative research in the area of the materials science of additive manufacturing which should clearly lead to advancements in the field. To promote their profile and career growth, recipients deliver an award lecture during the popular Additive Manufacturing Joint Keynote Session held during the TMS Annual Meeting & Exhibition.

Each of the Young Leaders introduced in this article received their awards at the TMS 2020 Annual Meeting & Exhibition (TMS2020), held from February 23–27, in San Diego, California. Join us at TMS2021 in Orlando to celebrate the next class of TMS Young Leaders.

FOUNDATION Secure a Strong Future for Your Profession

The Young Leaders Professional Development Awards highlighted in this article are made possible through the TMS Foundation, which supports students and young professionals with meaningful financial assistance and impactful career-building experiences. In providing these opportunities to early-career professionals, the TMS Foundation helps ensure a strong future for the minerals, metals, and materials community.

You can be a part of this important work by contributing to the TMS Foundation and supporting its mission. Visit www.TMSFoundation.org to learn more about the Foundation and to make an online donation. For questions or to talk to TMS Foundation staff personally, contact TMSFoundation@tms.org or call 1-724-776-9000. A Mark of Exceptional Promise: The 2020 TMS Young Leaders

Young Innovator in the Materials Science of Additive Manufacturing

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Douglas Hofmann

Douglas Hofmann is a principal at NASA Jet Propulsion Laboratory (JPL) as well as a founding member of the JPL Materials Development and Manufacturing Technology Group and the JPL Metallurgy Facility. He also serves as a visiting associate and lecturer in materials science and applied physics at the California Institute of Technology (Caltech). During TMS2020, he delivered his award lecture titled, "Innovation in Additive Manufacturing: A Perspective on an Early Career in Metal Alloy Development."

Hofmann has a B.S. and M.S. in mechanical engineering from the University of California, San Diego, and an M.S. and Ph.D. in materials science from Caltech. He notes that, "My TMS membership has been the constant in my research career, spanning from when I was a graduate student to today. The TMS annual meeting is the event I look forward to the most each year. Over the years, it has been a place where friendships have been made and

fostered, research collaborations have been forged, industry connections have been made, and where I am able to track the amazing progress in metallurgy from my peers. It is impossible to overstate the importance of how the personal relationships made through TMS have affected my career and I am indebted to those TMS members who have helped me along the way."

In addition to being named the first Young Innovator in the Materials Science of Additive Manufacturing, Hofmann has received many awards for his research, most notably the 2014 Presidential Early Career Award for Scientists and Engineers for his work in the development of metallic glass metal matrix composites.

Douglas Hofmann

"It is impossible to overstate the importance of how the personal relationships made through TMS have affected my career and I am indebted to those TMS members who have helped me along the way."

-Douglas Hofmann

2020 Young Leaders Professional Development Award Recipients EXTRACTION & PROCESSING DIVISION (EPD)

Gisele Azimi

Gisele Azimi is an associate professor cross-appointed between the Departments of Chemical Engineering & Applied Chemistry and Materials Science & Engineering at the University of Toronto. Azimi has been an active volunteer with TMS, serving as the lead organizer of the Rare Metal Extraction & Processing symposium and as chair of the Hydrometallurgy and Electrometallurgy Committee under the EPD. "Being part of TMS, EPD, and the Hydrometallurgy and Electrometallurgy Committee has provided me with the great opportunity to meet with my peers in our field and be at the forefront of leading-edge research in our community," observes Azimi. "I am thankful for receiving this award and I

will continue to be an active member of TMS."

Azimi's research focuses on achieving a sustainable future and mitigating the adverse effects of climate change through advanced recycling, industrial solid waste reduction, development of innovative materials with unique properties, and energy storage. She received her Ph.D. from the Department of Chemical Engineering and Applied Chemistry at the University of Toronto in 2010 and completed two postdoctoral appointments at the Massachusetts Institute of Technology. She is a registered professional engineer and has received a number of awards, including the TMS LMD/EPD Subject Award -Recycling.



Gisele Azimi





Hong Peng

Hong Peng

"It is a great honor to receive the 2020 TMS EPD Young Leaders Professional Development Award," remarked Peng, an Amplify Research Fellow at the School of Chemical Engineering, University of Queensland (UQ). His research covers the synthesis of environmental functional materials from mine waste and tailings, and investigation of nucleation and crystal growth in hydrometallurgy process through in-situ facilities and molecular simulation.

"TMS membership has provided me with opportunities to make important contacts among TMS leaders and work with prominent members by being a JOM advisor for special issues and participating in technical committee meetings." —Hong Peng Peng noted the significant impact volunteering with TMS has had on his career, remarking, "TMS membership has provided me with opportunities to make important contacts among TMS leaders and work with prominent members by being a *JOM* advisor for special issues and participating in technical committee meetings. I have also benefitted from presenting my work and communicating with experts in my field from institutes and industry."

Prior to his current position, he worked at the UQ–Rio Tinto Bauxite and Alumina Technology Centre as the Advance Queensland Research Fellow and in an industry-funded postdoctoral position after receiving his Ph.D. in chemical engineering at UQ.

FUNCTIONAL MATERIALS DIVISION (FMD)



Aurélien Perron

Aurélien Perron

Aurélien Perron is a materials scientist and the Actinide and Lanthanide Science Deputy Group Leader in the Materials Science Division of the Physical and Life Sciences Directorate at the Lawrence Livermore National Laboratory (LLNL). His research has focused on alloy phase stability, kinetics of phase transformation, and alloy design using molecular dynamic simulations, phasefield modeling, and mainly CALPHAD methodology.

"As soon as I became a TMS member, I felt that I was joining a warm, open-minded, and dedicated community with world-class expertise in materials science focused on doing its best in science through the mentoring, inclusion, well-being and development of its members," Perron observed. "This award is a wonderful opportunity to continue my journey within TMS, make important contacts with TMS leaders, network with prominent Society members, and become better acquainted with the business of FMD. Finally, this award will allow me to give back to the TMS community by assisting student contest activities and reinforcing my engagement in technical committees."

Perron received his Ph.D. in physical chemistry from the University of Burgundy, France, and worked for the French National Centre for Scientific Research and the French Alternative Energies and Atomic Energy Commission before joining LLNL. He has numerous publications and delivered over 77 presentations and has been actively involved in TMS committees and symposia.

"As soon as I became a TMS member, I felt that I was joining a warm, open-minded, and dedicated community with world-class expertise in materials science focused on doing its best in science through the mentoring, inclusion, well-being and development of its members."

— Aurélien Perron

Jayakanth Ravichandran

"I am both grateful and honored to receive the FMD Young Leaders Professional Development Award," remarked Jayakanth Ravichandran, an assistant professor in the Mork Family Department of Chemical Engineering and Materials Science with courtesy appointment in Ming Hsieh Department of Electrical and Computer Engineering at the University of Southern California.

"As a premier avenue to network and interact with materials scientists and engineers, this award will help me get more involved with the activities of TMS. I look forward to new opportunities and

LIGHT METALS DIVISION (LMD)

Abdallah Elsayed

Abdallah Elsayed is currently an assistant professor with the School of Engineering at the University of Guelph. Elsayed completed his undergraduate, masters, and Ph.D. degrees in mechanical engineering at Ryerson University with a research focus on light metals (aluminum and magnesium) casting solidification and characterization. He has participated in two research exchanges at the Indian Institute of Technology-Madras, investigating new grain refiners for magnesium alloys and has also collaborated with the Canadian Neutron Beam Centre to examine the solidification of aluminum and magnesium alloys using in-situ neutron diffraction.

Elsayed has long been involved with TMS and first joined "as a student under the Material Advantage program more than 10 years ago." He added that, "I immediately recognized the benefits of being affiliated with a professional society composed of passionate and talented members who contribute to the dissemination of research related to materials discovery through journals and conference presentations. Their knowledge helped me further my own research and advance my career. I look forward to continuing my fruitful association with TMS and to contributing to the TMS Foundation as a Young Leader."

His current research focus is on casting of aluminum and magnesium alloys for the automotive and aerospace industries. He has authored over 25 peer-reviewed publications, a book chapter, and numerous conference proceedings and presentations.

"I immediately recognized the benefits of being affiliated with a professional society composed of passionate and talented members who contribute to the dissemination of research related to materials discovery through journals and conference presentations."

— Abdallah Elsayed

Julien Lauzon-Gauthier

Julien Lauzon-Gauthier is a research engineer in the Aluminum Center of Excellence at Alcoa. He is a chemical engineer and holds an M.Sc. and Ph.D. in multivariate statistics and machine vision. "Over the years, TMS events and publications have allowed me to share my work in *JOM* and the *Light Metals* proceedings. Attending annual meetings also allowed me to interact with other researchers, colleagues, and suppliers that helped to broaden my knowledge and my network. I realize now that this is very valuable in my role as a research engineer," Lauzon-Gauthier noted of his



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Jayakanth Ravichandran



challenges, especially working with

other members of the FMD," stated

this acknowledgement from TMS."

in 2011 after which he performed

postdoctoral research at Columbia

and energy applications.

the University of California, Berkeley

Ravichandran. "This award is an important

my long-term career goals and I appreciate

Ravichandran received his Ph.D. from

University and Harvard University before

taking up his current position. His research

interests are in materials design, synthesis,

characterization, and physical properties of

complex materials for electronic, photonic,

encouragement for me to work towards

involvement in TMS thus far. Looking ahead, he added "I am honored to receive this award and look forward to this opportunity to step up and be more involved in the TMS committees."

Lauzon-Gauthier has a passion for learning and understanding new concepts and then sharing them with others. His post-graduate work focused on the carbon manufacturing process, then different process engineer roles at Alcoa led him to his current position in carbon R&D. What he enjoys most about his current role is the opportunity to support the work of several graduate students and collaborate with diverse teams across Alcoa to implement new technologies and provide technical support.

MATERIALS PROCESSING & MANUFACTURING DIVISION (MPMD)



Damien Tourret

Damien Tourret

"I am honored by this recognition and grateful to the TMS Foundation for supporting the growth of young scientists and engineers," said Damien Tourret, a researcher, Marie Skłodowska-Curie Fellow, and head of the Modeling and Simulation of Materials Processing Group at IMDEA Materials Institute in Spain.

Tourret received his M.Sc. in mechanical engineering from l'Institut National des Sciences Appliquées de Toulouse and his Ph.D. in materials science and engineering from MINES ParisTech. His main research interests revolve around linking materials processing routes to microstructures and properties, with a particular emphasis on multi-scale modeling of solidification and

Somayeh Pasebani

Somayeh Pasebani joined the School of Mechanical Industrial and Manufacturing Engineering of Oregon State University (OSU) in 2016 and established the Powder Metallurgy Additive Manufacturing Laboratory. Her research is focused on alloy development for selective laser melting and binder jetting additive manufacturing, as well as additive manufacturing of metal matrix composites for energy and other high-temperature applications.

She has been actively involved with several TMS committees including Powder Materials, Additive Manufacturing, and Diversity. Pasebani regards the Young Leaders Professional Development Award

"This recognition by my peers and leaders in my field provides encouragement and further bolsters my confidence. This will go a long way in helping me achieve my career goals."

— Somayeh Pasebani

Somayeh Pasebani

phase transformations during processing of metals and alloys.

"I greatly appreciate the positive effect that being a TMS member has already had on my professional development," observed Tourret. "Annual meetings have allowed me to meet collaborators, mentors, and distinguished experts in and beyond my field. The breadth of available volunteering opportunities offers every member a platform to learn and develop their technical and leadership skills. I am proud to be member of a society that is championing diversity."

Tourret is a member of TMS Solidification Committee and serves on the review board of *Metallurgical and Materials Transactions A*.

as recognition by her peers and leaders in her field that provides encouragement and further bolsters her confidence. "This will go a long way in helping me achieve my career goals. TMS is like my extended family where I get to meet my peers and make friendships that enrich my career, personal growth, and professional development. I am truly honored to have been a member of TMS for more than a decade, joining as a first-year Ph.D. student and getting involved with Material Advantage chapter activities, winning a graduate student poster competition, and receiving the Henry DeWitt Smith Scholarship."

She added: "As a faculty member, TMS has helped me tremendously in enhancing my leadership skills through membership in technical committees, diversity committees, and organizing symposiums and even outreach and volunteer activities. It is my great desire and pleasure to continue contributing to TMS and to help accomplish its valuable mission."

STRUCTURAL MATERIALS DIVISION (SMD)

Aeriel Murphy-Leonard

"TMS has been a vital partner in helping me grow and extend my network across multiple disciplines and areas," remarked Aeriel Murphy-Leonard, an NRC Postdoctoral Fellow at the Naval Research Laboratory in Washington, D.C. "Even as a graduate student I had the ability to serve in leadership roles on multiple committees. Being a member of TMS has been important in both my professional and personal development."

Murphy-Leonard completed her undergraduate education at the University of Alabama where she earned a degree in Metallurgical and Materials Engineering. She received her Ph.D. in materials science and engineering from the University of Michigan where her research focused on using high energy x-ray techniques

Richard Oleksak

Richard Oleksak is a research scientist working with the Structural Materials Team at the National Energy Technology Laboratory (NETL). He received his Ph.D. in chemical engineering from Oregon State University where his research focused on synthesis and characterization of nanomaterials for microelectronics applications. Upon joining NETL in 2015, his focus shifted to addressing corrosion issues in current and future power plants, with an emphasis on evaluating materials for next-generation supercritical CO₂ power cycles. His efforts in this area have been summarized in nine peer-reviewed journal publications.

"After changing research focuses early in my career, I have found TMS to be

and microscopy to understand grain size and alloying effects on microstructural evolution and deformation in magnesium alloys. During her time at Michigan she led and worked on many teams aimed at increasing the number of underrepresented minorities in engineering, including developing and implementing a leadership camp for female engineering students in Monrovia, Liberia.

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While at the University of Michigan she was awarded the Richard and Eleanor Towner Prize for Distinguished Academic Achievement, the Marian Sarah Parker Prize, the Susan A. Lipschutz Award, the Distinguished Leadership Award, and the MLK Spirit Award.

She also runs a lifestyle blog, AerielViews, aimed at young graduate and professional students.

a very welcoming organization and the perfect segue into the structural materials community," Oleksak stated. "TMS has been instrumental in connecting me with leaders in my research area and in serving as an excellent forum for the presentation and discussion of research. I am confident that the TMS annual meeting will remain a premier venue throughout my career for sharing research, forming collaborations, and fostering relationships in the materials community." He is currently an active member in the high-temperature corrosion community and hopes to continue research in this area to advance fundamental understanding and inform the selection and design of corrosion-resistant structural materials to enable future high-efficiency power systems.



Aeriel Murphy-Leonard



Richard Oleksak

"TMS has been instrumental in connecting me with leaders in my research area and in serving as an excellent forum for the presentation and discussion of research." - Richard Oleksak

Are You the Next TMS Young Leader?

Recipients of the TMS Young Leaders Professional Development Award are dynamic individuals who are looking to become future leaders within the minerals, metals, and materials community. They are committed to enhancing their leadership skills through active involvement as TMS volunteers and plan to work towards a future leadership role within the Society as a means of serving their profession.

If this describes you, or someone you know, visit the TMS Honors and Awards website at awards.tms.org to learn more about the award and its criteria. Applicants must be TMS members in good standing who are age 40 or younger. Awardees must also demonstrate a desire to play an active role in TMS and the potential to advance to volunteer leadership roles with the Society. Applications for the 2021 Young Leaders Awards are due August 15, 2020, so begin preparing your application packet today.



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TMS meeting headlines

View all upcoming meetings online at www.tms.org/Meetings.

Other Meetings of Note

Offshore Technology Conference (OTC 2020) May 4–7, 2020 Houston, Texas, USA

Solidification Course 2020 May 10–15, 2020 Les Diablerets, Switzerland

The 11th International Conference on Molten Slags, Fluxes and Salts (Molten 2020) May 25–29, 2020 Seoul, South Korea

Technological Innovations in Metals Engineering (TIME 2020) June 2–4, 2020 Youngstown, Ohio, USA

The 12th International Conference and Workshop on Numerical Simulation of 3D Sheet Metal Forming Processes (NUMISHEET 2020) July 19–24, 2020 Toronto, Ontario, Canada

The 14th International Symposium on Superalloys (Superalloys 2020) September 13–17, 2020 Seven Springs, Pennsylvania, USA

Materials Science & Technology (MS&T20) October 4–8, 2020 Pittsburgh, Pennsylvania, USA

Energy Materials 2020 October 13–15, 2020 Huzhou, Zhejiang, China



Philadelphia, Pennsylvania, USA Discount Registration Deadline: May 11, 2020

www.SafetyCongress.org

- Start off by joining the professional development course, Process Safety in Engineering and Industry, based on the Center for Chemical Process Safety's one-day overview of risk-based process safety.
- Two keynote speakers will deliver new insights on planning and collaboration to increase safety—Jim Wetherbee, former NASA astronaut and U.S. Navy captain, and Chris Hart, chair of the Washington Metrorail Safety Commission and founder of Hart Solutions, LLC.
- Breakout sessions will facilitate a deep dive into relevant topics such as human-machine interactions, incident investigation, lifting methods, unmanned aircraft systems, and safety in academic laboratories.

The 5th International Congress on 3D Materials Science 2020

June 28–July 1, 2020 Hyatt Regency Washington on Capitol Hill Washington, D.C., USA Discount Registration Deadline: May 18, 2020 www.tms.org/3DMS2020

onfirmed plenary speakers at pre

• Confirmed plenary speakers at press time for the 5th International Congress on 3D Materials Science (3DMS 2020) include: *Jaafar El-Awady*, Johns Hopkins University, USA; *Satoshi Hata*, Kyushu University, Japan; and *Helena Van Swygenhoven*, Paul Scherrer Institut, Switzerland.



July 26–31, 2020 The Ohio State University Columbus, Ohio, USA Discount Registration Deadline: June 15, 2020 www.tms.org/ICTP2020

- The 13th International Conference on the Technology of Plasticity (ICTP 2020) will feature keynote speakers presenting the latest improvements in the topic areas of global issues, simulation, materials, and innovation. See the list of speakers and presentations on the ICTP 2020 Technical Program page.
- Book your room for ICTP 2020 by June 26. Visit the conference website to see all of the housing options, both on The Ohio State University campus (The Blackwell Inn), and located nearby (The Graduate Columbus Hotel and Hyatt Regency).



12th International Conference on Magnesium Alloys and their Applications

June 15–18, 2021 Hotel Omni Mont-Royal Montreal, Quebec, Canada Abstract Submission Deadline: September 15, 2020 www.tms.org/Mg2021

- Contribute to the 12th International Conference on Magnesium Alloys and their Applications (Mg 2021) to be a part of the longest running conference dedicated to the development of magnesium alloys.
- Abstracts are requested for all aspects of magnesium research and development, from primary production to applications to end-of-life management. Topics will also include magnesium-based compounds and composites.



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call for papers

JOM is seeking contributions on the following topics for 2020. For the full Editorial Calendar, along with author instructions, visit www.tms.org/EditorialCalendar.



September 2020 Manuscript Deadline: April 1, 2020 Topic: Aluminum: Recycling and Carbon / Environmental Footprint

Scope: This topic covers recycling of aluminum (and its alloys), as well as mitigating the carbon footprint and/or environmental ramifications of both primary and secondary aluminum production.

Editors: David S. Wong and Anne Kvithyld **Sponsors:** Aluminum Committee and Recycling and Environmental Technologies Committee

Topic: High Temperature Processing of Complex Ores (By Invitation Only)

Scope: Invited papers only will be published in this topic covering pyrometallurgical processes developed to recover metals from complex ores. The term complex refers to multi-metal sulfide resources, which often present inclusions and intricate structural or alteration patterns. Also included are orebodies such as multi-metal oxide ores that complicate processing due to the diversity of minor elements they contain. This topic will present a state-of-the-art picture of the high-temperature processing of complex ore, from historical to best available technologies. **Editors:** Leili Tafaghodi, Camille Fleuriault, and Joseph Grogan

Sponsor: Pyrometallurgy Committee

Topic: Materials Research in Reduced Gravity Scope: Reduced-gravity experiments can isolate phenomena otherwise obscured in ground-based experiments, leading to new discoveries. Ground-based facilities for reduced-gravity experiments include drop tubes and towers that provide seconds of reduced gravity, aircraft that provide tens of seconds, and suborbital rockets that provide hundreds of seconds. Manuscripts are solicited in all areas of materials research employing reduced gravity, including crystal growth, containerless processing, materials processing and properties, and experimental facilities for materials research. **Editors:** Douglas M. Matson, Robert W. Hyers, Michael Sansoucie, Jonghyun Lee, and Shaun McFadden **Sponsors:** Process Technology and Modeling Committee and Solidification Committee

October 2020 Manuscript Deadline: May 1, 2020

Topic: Electrometallurgical Processing Scope: Industrial electrochemistry has made great strides in the manufacture of base, precious, refractory and reactive metals and their alloys/compounds. Significant improvements have been made to obviate some of the process challenges that include energy-efficiency, often complex process chemistry, throughput, and safety. Manuscripts covering current practices and future projections of electrometallurgy including advanced materials, materials recycling, nuclear materials, secondary recovery, contaminated water and waste treatments, and design of process equipment are invited.

Editors: Prabhat K. Tripathy, Takanari Ouchi, Hojong Kim, Hong (Marco) Peng, and Gisele Azimi **Sponsors:** Hydrometallurgy and Electrometallurgy Committee and Pyrometallurgy Committee

Topic: Interfacial Stability in Multi-component Systems

Scope: Papers are invited for this special topic covering interfacial bonding, interfacial stability, reaction kinetics, phase formation and characterization, and complex interfacial phenomena in various applied fields, including advanced microelectronics packaging, semiconductor systems, thermoelectric modules, and energy materials. **Editors:** Chao-hong Wang and Shih-Kang Lin **Sponsor:** Alloy Phases Committee

Topic: Practical Research in Processing Science (By Invitation Only)

Scope: A primary objective of research is the eventual reduction to practice and use by industry. Papers for this topic were solicited from "Purveyors of Processing Science and ICME: A Symposium to Honor the Many

Contributions of Taylan Altan, Wei Tsu Wu, Soo-Ik Oh, and Lee Semiatin," who devoted their careers to understanding processes and developing practical simulations of them. This special topic pays homage to the lifelong work of these researchers.

Editors: Adam Pilchak and Ed Herderick **Sponsors:** Titanium Committee, Shaping and Forming Committee, and ICME Committee

Topic: Solidification Behavior in the Presence of External Fields

Scope: The introduction of external fields, including electromagnetic fields, ultrasonic excitation, and mechanical shearing to solidification processes can significantly alter solidification behavior. This encompasses a wide range of applications in casting, welding, remelting, and additive manufacturing processes that have been explored in industry to refine grains, homogenize segregation, prevent defect formation, and break up agglomeration of particles. Publications focused on new scientific discoveries, engineering advancement and industrial applications are solicited under this topic. **Editors:** Lang Yuan and Andrew Kao **Sponsor:** Solidification Committee

November 2020 Manuscript Deadline: June 1, 2020 Topic: Aluminum and Magnesium: Casting Technology and Solidification

Scope: This topic covers the formation of structure, defects, and properties during casting and solidification of aluminum and magnesium alloys, with technologies including shape, continuous, direct-chill casting, and rapid solidification. The topic also covers new technological approaches to improve the quality of cast metal through optimization or changing of casting hardware or procedures. Both experimental and modelling papers are welcome for submission, though the modeling papers need to contain experimental validation. **Editor:** Dmitry Eskin

Sponsor: Aluminum Committee

Topic: In Situ Synchrotron and Neutron Characterization of Additively Manufactured Alloys

Scope: This special topic focuses on the in situ characterization of additively manufactured alloys using synchrotron- and neutron-based scattering, diffraction, and imaging techniques. Papers are solicited in areas including phase transformation and microstructure evolution during post-build heat treatment or mechanical testing, timeresolved x-ray imaging or diffraction during the build stage, residual stress evolution, and defect monitoring. **Editors:** Fan Zhang, Dhriti Bhattacharyya, and Lianyi Chen

Sponsor: Advanced Characterization, Testing, and Simulation Committee

Topic: Nanomechanics of Low-dimensional Materials

Scope: Low-dimensional materials, such as nanoparticles, nanofibers, and nanotubes have at least one dimension small enough for their physical properties to lay somewhere between individual atoms and the bulk material. The dimensional constraints of these materials result in a large surface-area-to-volume ratio that allows free surface and nanoscale structural features to dominate their physical response to mechanical deformation. Papers are invited covering experimental fabrication, characterization and testing, and computational modeling of mechanical behaviors of low-dimensional materials. **Editors:** Jiyoung Chang and Wei Gao **Sponsor:** Nanomaterials Committee

Topic: Nanostructured Materials under Extreme Environments (By Invitation Only)

Scope: This invited topic focuses on the response of nanostructured metals, ceramics, and composite materials in extreme environments (radiation, temperature, and mechanical loading). Materials with designed micro- and nanostructures may have unusual responses to such extreme environments. The investigation of the microstructural evolution in nanostructured materials through combined experimentation and modeling/simulation has proven crucial in establishing the understanding and design of this novel class of materials for future engineering applications under extreme conditions.

Editors: Youxing Chen and Jin Li **Sponsor:** Invited

Topic: Process Design and Materials Development for High-Temperature Applications

Scope: Due to their unique characteristics, refractory materials are of specific interest for functional and structural high-temperature applications. The focus of this special topic includes the design, development, and processing of refractory metals, alloys, and compounds. Contributions are invited from authors working on high-temperature materials to share and discuss their latest experimental and theoretical results and advancements. **Editors:** Ravi Enneti and Chai Ren **Sponsor:** Refractory Metals and Materials Committee

Topic: Silicon Production, Refining, Properties, and Photovoltaics (By Invitation Only)

Scope: This invitation-only topic focuses on silicon for solar cells, energy production, and other technologies. All technologies of Si production, refining, and characterization are covered. Life-cycle assessment of solar silicon processing, recycling of solar silicon components, solar cells and electronic components, and characterization of silicon materials for solar cells and other technologies are subjects of great interest for this collection.

Editor: Shadia Ikhmayies

Sponsors: Recycling and Environmental Technologies Committee and Materials Characterization Committee

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Most TMS awards have a nomination or application deadline of **April 1**. Visit <u>awards.tms.org</u> and view the individual award pages for more details.

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