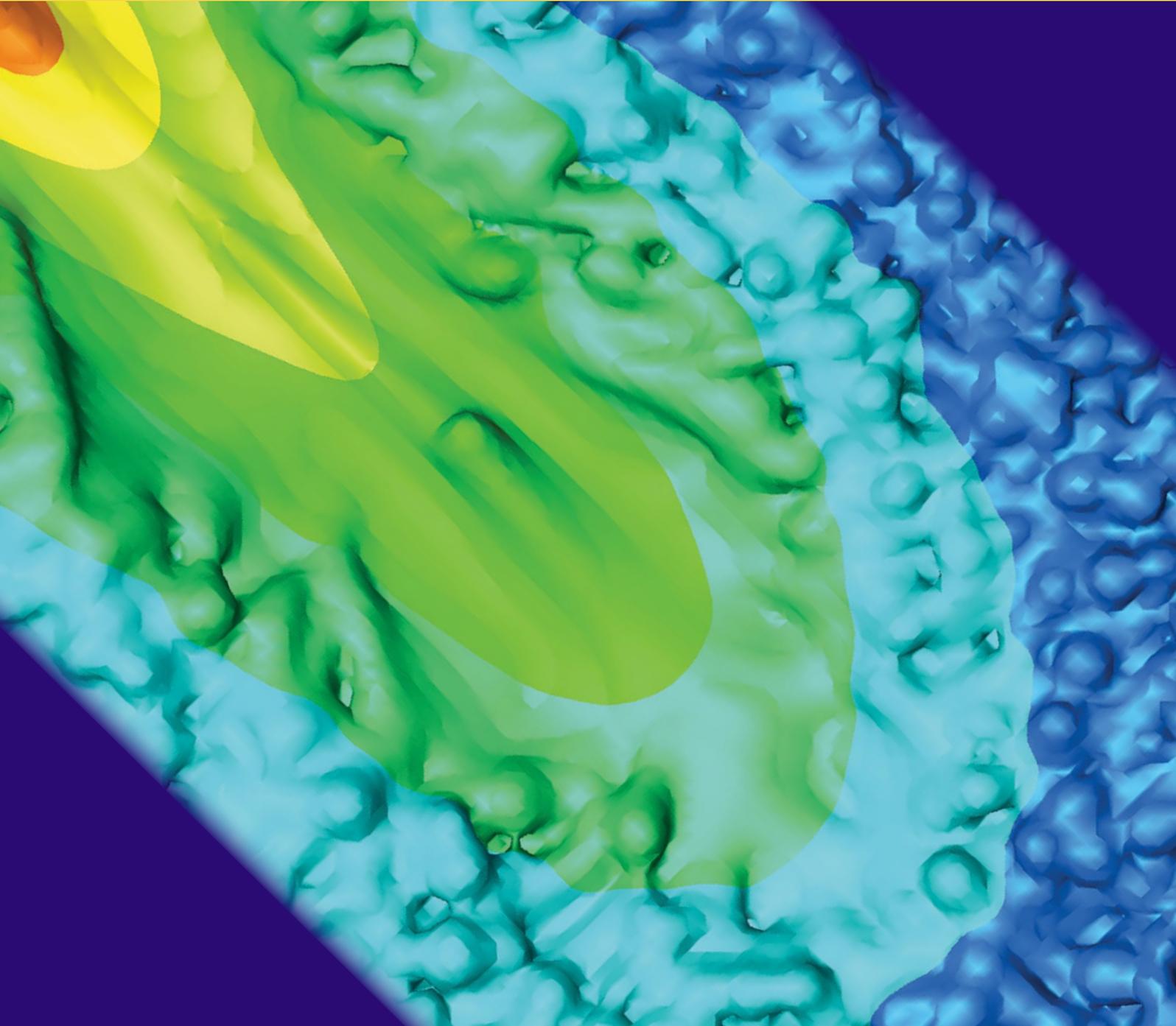


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MARCH 2019

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An official publication of The Minerals, Metals & Materials Society



THE FUTURE OF TMS: Unveiling the New TMS Strategic Plan

TMS

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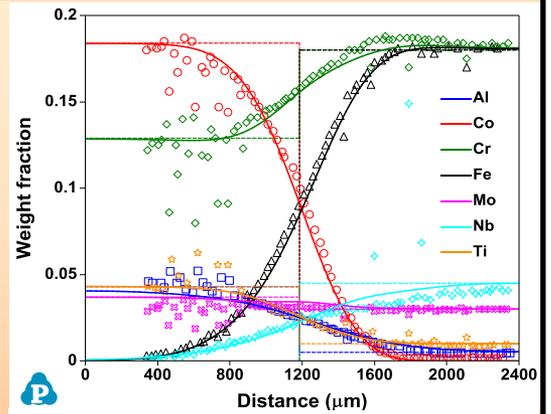
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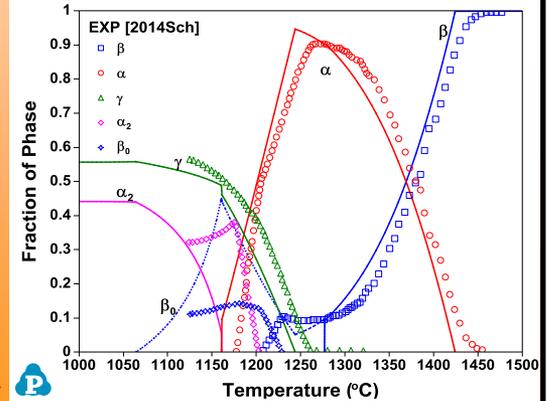
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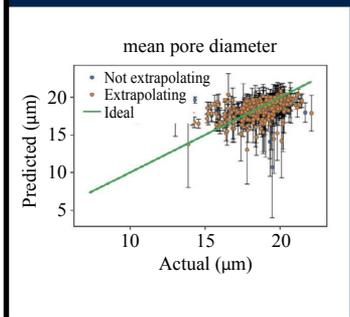
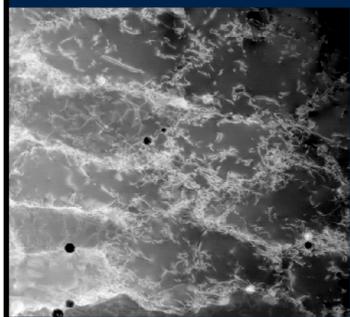
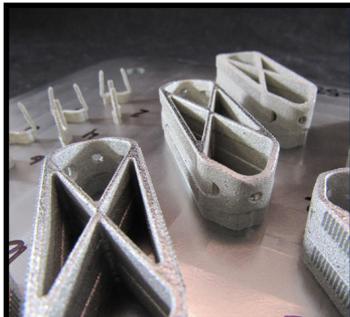
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Diffusion simulation between IN100 and Ni718



Phase fraction as a function of temperature for TNM alloy



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JOM congratulates the authors honored at the TMS 2019 Annual Meeting & Exhibition for their award-winning papers:

Light Metals Division JOM Best Paper Award

"Sustainability of Metal Structures via Spray-Clad Remanufacturing," Gregory Smith and Sanjay Sampath 70 (4) pp 512-520

Structural Materials Division JOM Best Paper Award

"Deformation Mechanism Map of Cu/Nb Nanoscale Metallic Multilayers as a Function of Temperature and Layer Thickness," Jeromy Snel, Miguel Alberto Monclus, Miguel Castillo-Rodriguez, Nathan Mara, Irene J. Beyerlein, Javier Llorca, and Jon Molina-Aldareguia 69 (11) pp 2214-2226

Members can read these and other articles from past issues of JOM at no charge by logging in to www.tms.org/Journals.



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About the Cover

From "Melt Pool Analysis and Mesoscale Simulation of Laser Powder Bed Fusion Process (L-PBF) with Ti-6Al-4V Powder Particles" by Santosh Rauniyar and Kevin Chou, this image shows a powder bed solidified track, melt pool, and temperature distribution with laser scanning from lower right to upper left. During the melting process, the flow of the liquid metal is outward (i.e., from higher to lower temperature) due to the surface tension gradient. As the heat source moves in an axial direction, the rear portion starts to cool down due to heat diffusion. During solidification, the melt flow changes direction from outer flow to inner flow which contributes to the formation of a bead. This continuous process of melting and solidification leads to a continuous single track.



March 2019 Guest Editors

Solid Freeform Fabrication

Invited
David Bourell, University of Texas

Additive Manufacturing: Validation and Control

Additive Manufacturing Committee
Judy Schneider, University of Alabama at Huntsville

Effective Production and Recycling of Powder

Materials: Part I
Powder Materials Committee
Kathy Lu, Virginia Polytechnic Institute

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.

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in the final analysis

“Hey, hey, hey, hey. Oh woh. . . . Don’t you, forget about me. Don’t, don’t, don’t, don’t. Don’t you, forget about me.”

—Simple Minds, “Don’t You (Forget About Me)”

While I enjoy both popular and obscure music from all seven decades of the rock-‘n’-roll era, I’ll confess a certain sweet tooth for the 1980’s genre called “new wave.” The Smiths, Alphaville, New Order, Echo and the Bunnymen, The The, Talk Talk, Oingo Boingo, . . . yummy! One of the best-known bands of new wave is Scotland’s Simple Minds. They achieved era-spanning fame with “Don’t You” as that song was the memorable musical signature for the much-loved film *The Breakfast Club*. I’m in the minority and generally “eh” about the movie, but that Simple Minds song is really good, and “Don’t You” became archetypal for a lot of Generation X’ers.

Last month, I wrote about the easy-to-embrace and just-adopted new TMS strategic plan, “TMS Aspires.” As we look forward to that plan’s rich potential (described later in this issue), we should not forget about the just-retired predecessor strategic plan: “The 2018 TMS Strategic Plan.” As adopted in 2014, the “2018” plan name may be more utilitarian and less evocative than “TMS Aspires,” but the “2018” plan remains a powerful inventory of ambitions expressed and actualized. As with all TMS strategic plans, much of this work was accomplished by mission-minded collaborations among TMS members, volunteers, staff, and partner organizations.

The “2018” plan consisted of five goals: advancing diversity and inclusion, accelerating industrial engagement in the Society, expanding our international activities, addressing energy and environmental challenges, and advocating materials and manufacturing innovation. How did we do in meeting these goals? There are dozens upon dozens of initiatives that spun out from the tactics. I can’t list them all here, but I can give the plan a quick valedictory. Hence, here are a dozen outcomes from the “2018” plan that I won’t, won’t, won’t, won’t forget about:

1. Introduced the biennial Bladesmithing competition at TMS2015.
2. Inaugurated an exciting all-conference keynote industrial presentation at the TMS Annual Meeting & Exhibition.
3. Established standing Industrial Advisory and International Affairs Committees.
4. Collaborated to build the successful Extraction 2018 conference as a multi-society international initiative. Work is underway for this event to be recurrent.
5. Authorized the Additive Manufacturing Committee as a bridge committee spanning all five TMS technical divisions.
6. Implemented the Family Care Grants program to engage TMS members who incur extra family-care expenses to attend the TMS Annual Meeting & Exhibition.
7. Originated the Frank Crossley Diversity Award to celebrate overcoming challenges in the pursuit of materials science and engineering careers.
8. Created the *Materials Explorers*[™] outreach initiative, which positions TMS members to inspire high school students toward pursuing careers in materials science and engineering while also cultivating diversity and inclusion in the pipeline.
9. Developed multifaceted memoranda of understanding in Europe with both the Federation of European Materials Societies and the German Society for Materials.
10. Crafted an agreement with the American Nuclear Society to jointly conduct the new biennial Materials in Nuclear Energy Systems (MiNES) meeting.
11. Started the *Journal of Sustainable Metallurgy*.
12. Conducted six commissioned studies on the future of materials.

Good stuff and just more evidence that everyone involved with TMS can take pride that the Society plans strategically and acts effectively. Such practices are anything but forgettable.

JOM

Volume 71

Number 3

March 2019



James J. Robinson
Executive Director

“As with all TMS strategic plans, much of this work was accomplished by mission-minded collaborations among TMS members, volunteers, staff, and partner organizations.”



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.

Apply for New TMS Awards

TMS Announces New Young Professional Awards

Two awards for early career individuals are now accepting applications for the 2020 awards cycle: the TMS Frontiers of Materials Award and the Young Innovator in the Materials Science of Additive Manufacturing Award. The deadline to apply for both awards is April 1, 2019.

The Frontiers of Materials Award will promote new programming at the TMS Annual Meeting & Exhibition in novel, exciting, or emerging topic areas. The award will be given to a top-performing young professional capable of organizing a Frontiers of Materials event in the form of a full symposium or single-session symposium.

The award recipient will deliver a keynote lecture during the Frontiers of Materials event and will be invited to organize a suite of thematic papers for an upcoming issue of *JOM*. To assist the recipient in coordinating the event, up to \$5,000 will be granted to offset any non-standard direct expenses such as special session room elements, registration waivers, and travel support for invited speakers.

This award is open to members and nonmembers who are 10 or fewer years removed from his/her terminal degree and who have demonstrated success in their proposed topic area. Applicants may

self-nominate for this award. Elements of a completed nomination package must include: a proposed Frontiers of Materials Event title and format; description of the topic area and scope statement; and a list of four to eight subject-matter experts who would be invited to speak during the event.

The Young Innovator in the Materials Science of Additive Manufacturing Award will recognize an outstanding, early career individual who is performing innovative research in the area of materials science of additive manufacturing (AM). Sponsored by the TMS AM Committee, the award intends to establish TMS as the home for young innovators in the AM field.

The awardee will receive a certificate and will deliver a lecture during the Additive Manufacturing Joint Keynote session held during that year's TMS Annual Meeting & Exhibition. Applicants must be TMS members aged 40 or under, and must submit a current curriculum vitae, nominator's statement outlining the innovative aspect of the researcher's work, and two additional supporting letters along with a completed application to TMS for consideration.

For a full list of award criteria and detailed information on how to apply for both awards, visit the TMS Honors and Awards website at awards.tms.org.



Bruce A. Moyer (Photo courtesy of Oak Ridge National Laboratory.)

Bruce Moyer Named AAAS Fellow

The American Association for the Advancement of Science (AAAS) presented a 2018 Fellow Award to TMS member Bruce A. Moyer during a February 2019 ceremony in Washington, D.C. Moyer currently works as a leader of the Chemical Separations Group in the Chemical Sciences Division at Oak Ridge National Laboratory (ORNL) and is an ORNL Corporate Fellow. He is also a Focus Area Lead for Diversifying Supply at the Critical Materials Institute.

Moyer was elected by the AAAS Section on Chemistry for "exemplary service, research, and technology development in the field of separation science and technology benefitting the environment, nuclear energy, and critical materials," according to ORNL.



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**

Leinad Energy Launches Security Token Offering

Toronto, Ontario, Canada: Renewable energy producer Leinad Energy has launched a Security Token Offering (STO). Leinad Energy is attempting to reduce its overhead and liability by using security tokens. Security tokens allow anonymized ownership information to be stored on the blockchain and automate transfers through smart contracts. Additionally, the STO can easily identify the people who are eligible for dividend payouts and automate the process, speeding up the payment process.

Chinese Industry Ministry Announces New Projects Ban

Beijing, China: The Chinese minister of industry has announced a capacity expansion ban that would apply to the iron, steel, cement, and flat-glass industries. The move from the world's top producer of steel and aluminum is an attempt to curb pollution. The ban follows an announcement in March 2018 that China would attempt to cut 30 million tons of annual production capacity. No geographic scope has been mentioned in association with the new ban.

Electric Vehicle Battery Metal Investment Fund Launched

Abu Dhabi, United Arab Emirates: Erik Prince, founder of Blackwater and the Frontier Services Group, has launched

a fund to capitalize on the increasing demand for battery metals across Africa and Asia. Prince aims to raise up to \$500 million to invest in metals such as cobalt, copper, and lithium that are used for batteries in electric vehicles. The fund is to target unexplored deposits of these metals that could be brought into production and then sold to larger mining companies.

Pancontinental Begins Nickel-Cobalt-Copper Drilling Project

Timmins, Ontario, Canada: Canadian mining company Pancontinental Resources Corporation has begun a diamond drilling program 65 kilometers northwest of Timmins in Ontario. The new mining project surrounds portions of the former Montcalm mine, which produced nearly four million tons of ore containing copper, nickel, and cobalt. The initial goal of the project is to drill at least 4,500 meters to test a series of new conductor targets that were identified last year using airborne Virtual Time Domain Electromagnetic max geophysics.

Boston Metal Raises Funds to Implement Metallurgical Process

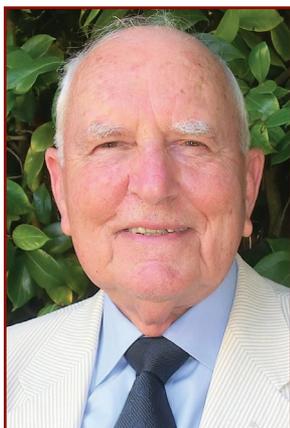
Boston, Massachusetts, USA: Boston Electrometallurgical Corporation (Boston Metal) has raised \$20 million towards implementing its metallurgical technology on an industrial scale. The funding comes from Breakthrough Energy Ventures, a firm focused on technology to help fight climate change, and The Engine, an incubator and investment fund affiliated with the Massachusetts Institute of Technology (MIT). The technology, first developed at MIT, uses an injection of electricity to melt metal, cutting down on emissions from traditional metal production processes.



Cape Lambert, Australia: Iron ore mining company Rio Tinto was forced to close part of its Cape Lambert export terminal in Western Australia due to damage sustained in a fire. The fire broke out during a maintenance shutdown and was extinguished with no injuries. Operations have restarted for much of the facility, but impacted areas remained closed at press time.

Honoring a Legend: The William D. Nix Award

Kaitlin Calva



William D. Nix

Beginning in 2020, TMS is pleased to honor long-time member and TMS Fellow William D. Nix with a namesake award to celebrate his contributions to and influence on the field. The new William D. Nix Award will highlight and promote continued progress and innovation relevant to research in the underlying mechanisms and mechanical behavior of macro-, micro-, and nanoscale materials.

Through a fund established within the TMS Foundation by Nix's doctoral students the award will include a medal, certificate, and \$5,000 cash prize. The recipient will also present a lecture at the same annual meeting at which they receive their award. The inaugural William D. Nix Award will be presented at the TMS-AIME Awards Ceremony during the TMS 2020 Annual Meeting & Exhibition, February 23–27, 2020, in San Diego, California. The deadline for nominations for this and other TMS Society and Division awards is **April 1, 2019**. Visit the TMS Honors and Awards

website at awards.tms.org for award criteria and nomination information.

“Bill Nix's impact on the materials community has been extraordinary,” said Kevin Hemker, 2018 TMS President. He then explained why he and several of Nix's other past graduate students, wanted to create this award: “We hope to honor Bill and the tremendous legacy that he has developed and shared with the materials community; to highlight and promote continued progress and innovation relevant to research into the

underlying mechanisms and mechanical behavior of materials; and to emphasize the critically impactful role that mentors play in our profession.”

“Professor Nix has been a leading authority in the field of materials research for more than half a century,” continued George M. Pharr, professor, Texas A&M University, noting just one of the many reasons for the establishment of this award. “It is most fitting that he be recognized for his long history of exemplary contributions with a major TMS award bearing his name.”

“By establishing this award in his honor, we will be able to ensure that his name remains prominent in front of current and future participants in the global materials science and engineering communities,” elaborated David Matlock, professor, Colorado School of Mines. “His recognition of the importance of understanding mechanical properties of materials at all length scales will be maintained by the lectures to be offered by award recipients in the future. Hopefully, future recipients will also take the time to learn a little about Nix's legacy as they prepare for their lectures and share their thoughts during their presentations.”

Nix's journey with TMS began 60 years ago as a graduate student at Stanford University. Upon receiving his Ph.D. in materials science in 1963, he joined Stanford faculty and became a professor in 1972. “TMS became the primary professional home for my students and me and for the fundamental work that we did together. For decades we presented our work at TMS meetings before publishing in archival journals,” said Nix.

In his early career, Nix focused on studying and explaining the mechanical behavior of structural materials at high temperatures as well as creep and creep fracture. This work led to the development of new high-temperature alloys and composites for use in extreme

Fast Facts About the William D. Nix Award

Criteria: Award recipients must have an established record of research, publications, and/or patents in the field of mechanical behavior of materials. In addition, this work must have had, or be likely to have, a significant and lasting impact on the understanding of the underlying mechanisms and/or attendant mechanical behavior of macro-, micro-, and nanoscale materials.

Award: Medal, certificate, award lecture, and a \$5,000 cash prize.

Deadline: April 1, 2019, is the deadline for nominations for the inaugural William D. Nix Award. Visit awards.tms.org for details and the nomination form.

For questions or additional information, contact Deborah Hixon, TMS Awards Program Administrator, at hixon@tms.org.



environments, work which eventually earned him election to the National Academy of Engineering (NAE) in 1987 and to the 1988 Class of TMS Fellows. In 1989 he was appointed the Lee Otterson Professor of Engineering, a position he holds today as a professor (emeritus). He also served as chair of Stanford's Department of Materials Science and Engineering from 1991 to 1996 before becoming professor emeritus in 2003.

Nix also proved to be a visionary leader in materials science and engineering through his studies in mechanical behavior of thin films used in electronic, magnetic, and optical devices. His work in this area helped to establish the field of thin film mechanical properties, providing support for the microelectronics industry. "His unique ability to evolve his interests to adapt to the changing needs of society is an attribute that truly is the mark of an excellent educator and researcher," Matlock remarked. "He has continually updated his teaching and research activities to ensure that, on graduation, his students were at the forefront of their chosen fields."

His research has earned many accolades throughout his career, most notably the 1979 Champion H. Mathewson Award, 1988 IOM/Mehl Award, and 1995 Educator Award from TMS; the Acta Materialia Gold Medal Award in 1993; Sigma Xi's 2017 Monie A. Ferst Award; election to the American Academy of Arts and Sciences in 2002; and election to the National Academy of Sciences (NAS) in 2003, making him one of a select number of people to be named to both the NAS and the NAE. Nix has also published more than 500 papers throughout his career, and is widely known for co-authoring two influential textbooks in the field—*The Principles*

of Engineering Materials (1973) and *Imperfections in Crystalline Solids* (2016).

Above all other professional and technical accomplishments, Nix knew that one of the best ways he could serve the minerals, metals, and materials community was through the education and mentorship of his students. When asked by *JOM* what accomplishments he was most proud of, Nix responded: "That one is easy. The achievements of the doctoral students with whom I have had the privilege to work. I recently gave a talk on the work my students have done and came to realize that almost without exception they are known for the work they did after leaving me. So their accomplishments are the ones for which I am most proud."

His students, in turn, feel honored to have known Nix. "As I look back on my career, I can truly say that I have been privileged to have had him as a mentor during my graduate education and as a friend and professional colleague since," Matlock said. "Much of my success as an educator stems from his influence on me, something for which I am truly thankful."

"It is my hope that this award and lecture would, in time, have the same impact as the Institute of Metals/Robert Franklin Mehl (IOM/Mehl) and William Hume-Rothery Awards have had," Nix said, reflecting on this latest aspect of his legacy. "Those awards have been uncannily good in identifying and recognizing the very best people in materials science and engineering. And as with those awards and lectures, my hope is that this award would focus on fundamental materials science and engineering and the people committed to such work."

Bill Nix and Jean, his wife and partner of 60 years (pictured seated, fourth and fifth from right), and many of his past students gather for a "Nix Academic Family Reunion" on the eastern shore of Maryland several years ago.

Turning Challenges into Opportunities: JOM Talks with 2018 TMS President Kevin Hemker

Kaitlin Calva



Kevin Hemker

Editor's Note: Kevin Hemker will complete his term at the TMS 2019 Annual Meeting & Exhibition (TMS2019), March 10–14, 2019, in San Antonio, Texas. *JOM* invited him to reflect on his experiences as president, as well as his hopes for the future of TMS.

JOM: What were your most significant challenges as TMS President?

Hemker: I have learned that challenges are best addressed when viewed as opportunities and my approach as president has been to work with the Board of Directors, Executive Director Jim Robinson, the TMS staff, and other key stakeholders to make sure the challenges that TMS faced this year were resolved as opportunities. Over the past year, this approach has allowed us to strengthen intersociety collaborations, make TMS a more inclusive Society, and define the future of our profession.

One tangible example of this comes from the new partnerships that we have developed to organize meetings for our members. Extraction 2018 was borne out of the realization that there were too many overlapping meetings and a genuine desire by our members to collaborate with colleagues at the Society for Mining, Metallurgy & Exploration (SME) and The Metallurgy and Materials Society (MetSoc) of the Canadian

Institute of Mining, Metallurgy and Petroleum (CIM). The end result was a very successful, jointly sponsored meeting in Ottawa, Canada, in August. Jim Robinson, Patrice Turchi, Stan Howard, and I also participated in the American Institute of Mining, Metallurgical, and Petroleum Engineers (AIME) Board of Trustees retreat that month, which resulted in a more cohesive organizational structure that will facilitate effective collaborations with our sister AIME societies.

Similarly, in-depth discussions with the Materials Science and Technology (MS&T) conference partner societies resulted in a stronger and more equitable alliance with the American Ceramic Society (ACerS) and the Association for Iron & Steel Technology (AIST) that not only ensures that MS&T will continue, but provides us with the flexibility to partner with other societies when it is to our advantage to do so. In parallel to these activities, our organization of specialty conferences has also increased; we are actively pursuing mutually beneficial collaborations with international societies in North and South America, Europe, Asia, and Australia.

My second example is related to our own internal structure. The landscape for retirement plans has shifted dramatically in recent decades, and the Board of Directors put considerable energy and careful discussion into a year-long study of the retirement benefits that TMS offers its staff. Working with outside consultants, the Board developed a plan that supports the long-term financial stability of TMS, while also aligning staff retirement benefits at or near the top with those offered by similar societies.



At Extraction 2018 in August, Hemker (right) and Barbara Arnold (left), SME President, presented Michael Moats, Missouri University of Science and Technology and Extraction 2018 organizer, with the 2018 TMS/SME/AIME James Douglas Gold Medal Award.

JOM: What do you consider as your most impactful contribution(s) to the Society over your Presidency?

Hemker: I am very proud of the contributions described previously, but I firmly believe that the greatest impact that I will have on TMS will come from the individuals that I have invited, encouraged, cajoled, and persuaded to participate more fully in TMS activities. I have focused on getting young professionals more involved because I am convinced that their diversity, energy, creativity, and enthusiasm will make TMS a destination materials society for years to come.

JOM: Diversity and inclusion have featured prominently in the TMS Strategic Plan for several years. Looking back on the year, what progress has been made on our diversity and inclusion efforts?

Hemker: It is widely understood that everyone benefits when all TMS members can aspire to the full suite of honors, awards, engagement, and leadership opportunities that the Society has to offer, but like most engineering societies, we are demographically challenged and there is still much work for us to do.

The TMS Summits on Diversity in the Minerals, Metals and Materials Professions (DMMM) are unique to TMS and highly regarded and valued in the broader community. I found the overall atmosphere and personal interactions that I had at DMMM3 in July to be very positive and uplifting. Most attendees were equally enthusiastic, and I am pleased to be able to report that the TMS Diversity Committee is actively exploring ways to strengthen future summits and to incorporate key pieces of the DMMM experience into our annual meetings and other TMS venues.

The Board of Directors reviewed and modernized the ways that we recruit our leaders and select our Fellows under 2017 President Dave DeYoung’s leadership. I am proud to be able to report that those new policies have been implemented over the past year and are already beginning to have a noticeable impact. Nevertheless, the Board recognizes that we still have a long way to go and has made inclusivity the foremost aspiration of the 2021 Strategic Plan, known as TMS Aspires.

Objectives and activities in this area will include championing an open dialogue on the practice of inclusivity as well as enhancing the engagement of our industrial and international members.

JOM: As you have mentioned TMS Aspires, could you please share a bit more about the development of these new strategic directions for the Society? (EDITOR’S NOTE: For more details on TMS Aspires, read, “New Strategic Plan Reveals TMS Aspirations,” in the March 2019 issue of JOM: The Magazine.)

Hemker: We started this exercise by asking the Board members and a variety of TMS stakeholders three simple questions: What is one aspect of TMS that you would keep no matter what? What is one thing would you change about TMS if you could? And how would you change it? Compiling the responses helped us codify TMS values and create a key list of actionable items. Building off of the postulate that a strategic plan should define what you aspire to be, we refined what we had into the three specific goals. TMS aspires to be: a highly inclusive Society; the place where global materials practitioners come together; and the Society that envisions, defines, and enables the future. These three goals are underpinned by a series of specific objectives and tasks and we are eager to get started on them, but anticipate that this plan will be a living document and that the objectives and tasks will adapt as we progress.

JOM: You speak often of the criticality of engaging young people in the Society. In what ways have you advanced this perspective as president?

Hemker: Last year I had the opportunity to lead an ad hoc committee to oversee the formation of a TMS Leadership



Hemker talks one-on-one with attendees of the TMS 2018 Annual Meeting & Exhibition (TMS2018) during a Meet & Greet session at the TMS Member Welcome Center.

“I have focused on getting young professionals more involved because I am confident that their diversity, energy, creativity, and enthusiasm will make TMS a destination materials society for years to come.”
—Kevin Hemker



Hemker delivers his Presidential Address at the TMS-AIME Awards Ceremony held on Wednesday, March 14, during TMS2018 in Phoenix, Arizona.

"We cannot afford to ignore the changes that are occurring around us...TMS must continuously seek out opportunities to significantly enhance and improve the overall experience that it offers its members."

—Kevin Hemker

Recruitment Committee (LRC) that is based on the principle that a grassroots society like TMS works best when one member encourages another member to get involved. At one point I asked the Board of Directors how many of them were sitting at the table because they received a personal invitation to get more involved in TMS, and everyone

raised their hand. The committee that we have formed is meant to identify individuals with leadership potential and encourage them to undertake volunteer positions that may, with time, lead to matriculation into Society leadership positions. Jim Foley is chairing the first LRC this year, and positioning it in a way that will supplement, not replace, all existing forms of volunteer recruitment.

I am also thrilled that the Programming Committee championed a new award, the TMS Frontiers of Materials Award, which specifically targets young professionals. This award is designed to attract top-performing early career professionals to TMS as well as to deliver cross-cutting programming, and I was pleased to be able support its implementation during my year as president. **(EDITOR'S NOTE: Read more about this award in "Apply for New TMS Awards," in the March 2019 issue of JOM: The Magazine.)**

JOM: As TMS President, what do you feel are the most significant challenges facing the minerals, metals, and materials professions, and how is TMS poised to address them?

Hemker: There is much that TMS does right and that its members desire in a professional society, but one of my biggest concerns is that TMS could become too complacent with the status quo. We cannot afford to ignore the changes that are occurring around us.

Changes in our key industries, the way we do research, the creation and use of digital data, and the ways that we communicate, collaborate, and educate each other are fast becoming the new reality. TMS must continuously seek out opportunities to significantly enhance and improve the overall experience that it offers its members

With this in mind, I am very pleased that the third goal of the TMS Aspires strategic plan is to be the society that envisions, defines, and enables the future by gathering and empowering thought leaders to scope the future of materials science, engineering, and technology. We have great strength in this area as actualized by our success with convening workshops of TMS experts, interfacing with government sponsors, and writing forward-looking reports.

JOM: What lessons are you taking with you from your presidential experience?

Hemker: The past year has reinforced my belief that good leadership involves setting clear priorities, engaging talented individuals, resourcing them appropriately, and getting out of their way. It has been a real pleasure to work with such a talented and dedicated group of volunteers and professional staff. I have especially enjoyed working closely with and getting to know our Executive Director Jim Robinson. I hope that I have taught him a few things along the way, and I know that he has made me a better listener, strategy planner, problem solver, and leader.

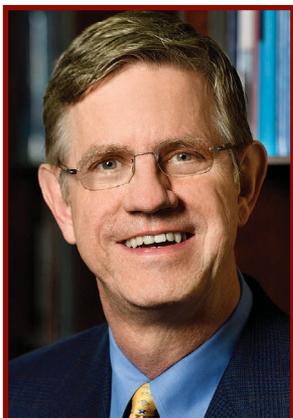
JOM: What advice would you give to future presidents?

Hemker: I would advise anyone that might be interested in becoming TMS President to get engaged in TMS early and often. Once engaged, progression from technical committees, to divisional activities, functional committees, and service on the Board of Directors flows naturally. I know that Jim Foley is well-poised to have a fantastic year as President, and my advice to future presidents would be to serve the whole Society, to empower the volunteer leaders and staff that you work with, and to have fun.



New Strategic Plan Reveals TMS Aspirations

Kelly Zappas



“Long-term planning should capture the aspirations of our members.”

—Kevin Hemker,
2018 TMS President

What kind of Society does TMS strive to be? A highly inclusive materials organization. The place where the world’s materials practitioners come together. A leader in enabling the future of our profession. The new TMS strategic plan, known as TMS Aspires, provides a portrait of our ideal professional community as we look ahead.

Ratified by the TMS Board of Directors in October 2018, the new TMS Aspires strategic plan was developed over the course of the year using input from a variety of volunteer and staff leaders, who were asked what should be kept and what should change going forward with the organization.

“There is much that TMS does right, and the desire to protect that is

widespread and broadly shared,” said Kevin Hemker, 2018 TMS President, who led the development of the new plan. “Nevertheless, the world is changing around us, and TMS must vigorously seek out opportunities to significantly enhance and improve the overall experience that it offers its members.”

In considering the new plan, the Board wanted to create more than a to-do list of projects. They wanted to inspire excitement for the Society’s future.

“Day-to-day operations require tactical decisions,” said Hemker. “But long-term planning should capture the aspirations of our members.”

The Board rechristened the strategic plan TMS Aspires and synthesized all of the input received into a compact set of three overarching goals, or aspirational statements, each of which is supported by a suite of objectives and tactics. These new goals and objectives reflect many of the values present in the Society’s previous strategic plan, which included commitments to advancing diversity and inclusion in the profession, accelerating industrial engagement in TMS, and globally expanding the portfolio of international activities.

Read on to gain insights from three of the TMS Board members who contributed to the strategic planning process regarding the three main goals of the TMS Aspires plan.

How Will TMS Look in 2021?

Over the next three years, the TMS Board of Directors, staff, and volunteers will look to the three goals and their associated objectives outlined in this article to guide the Society’s progress and activities. For reference, these goals and objectives are also summarized on the TMS Aspires website at www.tms.org/TMSAspires.

All of our members can help us to make these aspirations a reality by volunteering with TMS and contributing their expertise and ideas to our community. For a listing of ways you can get involved with TMS, visit volunteer.tms.org.



“We must continually work to change our culture, such that diversity and inclusion are inherent in everything we do.”

—Amy Clarke, 2018 TMS Membership & Student Development Director

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

The Board overwhelmingly selected this as one of the three main focus areas for the Society over the next several years, according to Amy Clarke, 2018 TMS Membership & Student Development Director.

“To achieve this goal, we must continually work to change our culture, such that diversity and inclusion are inherent in everything we do,” said Clarke. “This requires acknowledging our strengths and weaknesses, and changing our behaviors.”

This goal builds on one found in the Society’s previous strategic plan: to advance diversity and inclusion in the minerals, metals, and materials profession.

“We have made some progress to date,” said Clarke, citing the creation of the TMS Diversity Committee and the TMS PRIDE

working group; the approval of an official TMS Diversity Statement; three impactful installments of the Diversity in the Minerals, Metals, and Materials Professions summit series; the establishment of the Ellen Swallow Richards and Frank Crossley Diversity Awards; and the commitment to the family care grant program and nursing mothers room available at the TMS Annual Meeting & Exhibition. “But opportunity still exists to continue the work we have started and to support new initiatives.”

In addition to creating an inclusive professional environment for people of all gender identifications, ethnicities, nationalities, and abilities, the objectives of this new goal include enhancing opportunities for engagement in all sectors of the minerals, metals, and materials community.

“Our membership includes individuals from academia, government, and industry,” said Clarke. “We want to include and serve all of our members. We believe we can do more to expand the portfolio of services and benefits to industrial members and industry and to more fully engage our international members.”

Goal 1 Objectives:

- Assure that there are no organizational barriers to members who aspire to any relevant TMS honors, awards, and engagement or leadership opportunities.
- Champion an open dialogue and practice on diversity and inclusivity.
- Expand the portfolio of services and benefits tailored to industrial members and to industry.
- Expand the engagement of non-U.S. members in Society activities.



“Many of us first learned about TMS by attending a TMS event and personally connecting with practitioners at every level.”

—Brad Boyce, 2018 TMS Programming Director

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.

Technical meetings and networking opportunities were two of the most highly valued aspects of TMS membership, according to the 2018 TMS Member Survey, conducted in August 2018. These key aspects of TMS membership figure prominently in the new TMS Aspires plan.

“Many of us first learned about TMS by attending a TMS event and personally connecting with practitioners at every level,” said Brad Boyce, 2018 TMS Programming Director. “Our value to the international materials community comes in part from our ability to provide a forum that unites like-minded practitioners in a setting where leading-edge ideas are

shared. Meetings not only help us learn about research being conducted around the world; they also energize individuals to take what they’ve learned back to their home institutions to accelerate progress.” In the new plan, significant emphasis is placed on TMS’s flagship annual conference, the TMS Annual Meeting & Exhibition, with the goal of establishing this thriving event as *the* professional destination for the international materials community.

“The TMS Annual Meeting is known for its expansive programming,” said Boyce. “Because of its size, it’s also a venue where participants can reconnect

with past colleagues and network with potential new collaborators. We intentionally create grassroots organizational opportunities at the annual meeting where participants can volunteer their own expertise to help shape the direction of the conference, the Society, and the profession. We want to create such a strong value for our participants that when they leave the meeting, they have already decided that they will attend next year.”

In addition to strengthening an already healthy annual meeting, the new strategic plan aims to add to the Society’s existing portfolio of events, which, for 2019, will include two established, annual

multidisciplinary conferences; several new installments in recurring specialty conference series; standalone short courses; and new events, such as the World Congress on High Entropy Alloys (HEA 2019), scheduled for November 17–20, 2019, in Seattle, Washington.

“We are always on the lookout for new growth areas—not just topical areas, but also areas to connect better globally and to connect with the needs of industry,” said Boyce.

Goal 2 Objectives:

- Establish the TMS Annual Meeting & Exhibition as the destination event for the international materials community.
- Assure that TMS receives an equitable benefit from its partnerships and relationships over time.
- Add to the portfolio of TMS owned and managed events.

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.

The third goal of TMS Aspires looks beyond the boundaries of TMS’s membership and activities to the future of the profession and of society as a whole.

“I believe that thinking about the future as a collective is important for the sustained growth of the Society and its members,” said James Foley, 2018 TMS Vice President. “Goal 3 is important to the membership as it defines the future of the profession.”

This third goal encompasses TMS’s leadership in organizing roadmaps and technical reports that guide future research and development plans for society as a whole. TMS’s success in this regard lies in its ability to convene leading experts across disciplines and organizations to identify recommendations that can be implemented throughout the professional community. “It’s important for TMS to take a leading role because TMS members have the knowledge and experience to provide a trusted resource that can guide the allocation of limited resources,” said Foley. In 2018 and 2019, TMS provided this type of expertise in the publication of four reports:

- *Advanced Computation and Data in Materials and Manufacturing: Core Knowledge Gaps and Opportunities*
- *Harnessing Materials Innovations*

to Support Next Generation Manufacturing Technologies

- *Metamorphic Manufacturing: Shaping the Future of On-Demand Components*
- *Verification and Validation of Computational Models Associated with the Mechanics of Materials*

The Society is committed and on track to continue producing these types of valuable resources to the community in the years to come.

This third goal also includes an objective to maintain and expand the Society’s leadership in areas such as integrated computational materials engineering (ICME), three-dimensional materials science (3DMS), and additive manufacturing—many of which were areas of focus in past strategic plans—and to add additional emerging technology areas.

“TMS is already a leader in several of these areas, and where it is not the sole leader, it is a strong contributor to the field,” said Foley. “Where we expand in the future will be driven by the ever-changing swing in national research.”



“I believe that thinking about the future as a collective is important for the sustained growth of the Society and its members.”

—James Foley, 2018 TMS Vice President

Goal 3 Objectives:

- Expand the portfolio of TMS-led workshops, studies, and reports that are defining the future of the profession.
- Maintain and expand TMS leadership in ICME, 3DMS, additive manufacturing, and other emerging materials and manufacturing technologies.



Announcing the 2019 TMS Division Award Recipients



Ashley-Anne Bohnert and Carol Matty



Nominations Due April 1

Many of the award recipients celebrated in this article were selected for the honor of a TMS award thanks to a thoughtful and well-prepared nomination packet submitted by a colleague.

You can also put forth a deserving candidate for a TMS award. To begin, visit awards.tms.org to see a complete list of TMS awards and learn more about the nomination process. Then, prepare your nomination packet for a 2020 TMS award and submit it before the April 1, 2019, deadline. For assistance or additional information, contact Deborah Hixon, TMS Awards Program Administrator, at awards@tms.org.

In addition to the many Society-level awards and scholarships annually administered by TMS, a host of special awards are conferred by each of the Society's five technical divisions: Extraction & Processing, Functional Materials, Light Metals, Materials Processing & Manufacturing, and Structural Materials.

TMS Division Awards are a special honor as they often celebrate noteworthy accomplishments within a specific realm of technical expertise or laud distinguished service to a technical division or the membership it serves.

Most of the division awards highlighted on these pages will be conferred during special recognition programs or division luncheons hosted during the TMS 2019 Annual Meeting & Exhibition (TMS2019).

Meaningful professional recognition is an important tool for acknowledging the achievements of our peers and all TMS2019 attendees are encouraged to show their support by attending these special sessions. Visit www.tms.org/TMS2019 for additional information or to access a schedule of events.

EXTRACTION & PROCESSING DIVISION (EPD) DISTINGUISHED LECTURER AWARD

An outstanding scientific leader in the field of nonferrous extraction and processing metallurgy is invited to present a comprehensive lecture at the TMS annual meeting to recognize his or her contribution.



Sridhar Seetharaman,
*Professor and Associate Vice
President for Research, Colorado
School of Mines*

Citation: *Understanding the kinetics and thermodynamics of high temperature reactions and transformations relevant to processing and performance of metals.*

Lecture: “The Importance of Transient Phenomena in Metallurgical Processes”
“Research in materials extraction and processing are of great importance for enabling a responsible use of Earth’s resources since these steps often are the most energy and carbon intensive steps of metals production,” Seetharaman noted. “The EPD of TMS has been at the forefront of advancing this area, and to be recognized by my colleagues and peers is a great honor. It is perhaps the best possible encouragement for me as an academic to continue to teach and carry out research in this field.”

EPD DISTINGUISHED SERVICE AWARD

This award recognizes an individual whose continuous service to the EPD activities has clearly facilitated the Society’s capability to serve its EPD-oriented members and their supporting organizations.



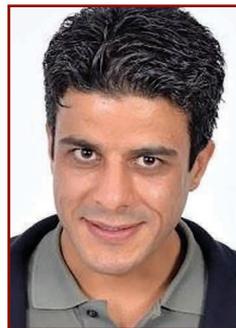
**Jiann-Yang (Jim)
Hwang, Professor, Michigan
Technological University**

Citation: *For creative and exceptional contributions and leadership for mineral processing and metallurgy community for over 40 years.*

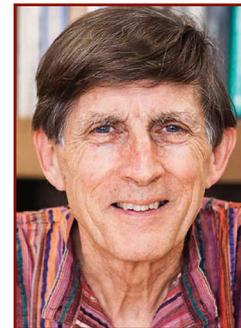
“TMS provides a great platform for me to interact with colleagues from all over the world,” stated Hwang. “I am very honored to receive the 2019 TMS Extraction & Processing Division Distinguished Service Award. This is recognition from my colleagues and the Society. I am very thankful for the support from my family, my department, TMS, my colleagues, and friends. I will continue my efforts to make the Society stronger and more influential.”

EPD SCIENCE AWARD

This award recognizes a paper, or series of closely related papers, with at least one common author, which represents a notable contribution to the scientific understanding of extraction and processing metallurgy, with emphasis on nonferrous metals.



Ata Fallah-Mehrjardi



Peter Hayes

Ata Fallah-Mehrjardi, Senior Manager, Aurubis AG; Taufiq Hidayat, University of Queensland; Peter Hayes, Professor and Program Leader, University of Queensland; and Evgueni Jak, Professor, University of Queensland

Paper: “Experimental Investigation of Gas/Slag/Matte/Tridymite Equilibria in the Cu-Fe-O-S-Si System in Controlled Gas Atmosphere: Development of Technique,” *Metallurgical and Materials Transactions B*, December 2017.

“It is a great honor that my publication has been recognized by the science community to have a major contribution in the understanding of metallurgical processes,” stated Fallah-Mehrjardi. Hayes added, “For me, breaking new ground is always exciting, and it is rewarding to know that others working in the field value this research.”

Discover Even More TMS Awards

This article highlights the awards sponsored by the Society’s five technical divisions, but there are also many several other awards administered by TMS each year. These include Society level awards, honors specific to young professionals, and scholarships for students in the field.

Visit the TMS Honors & Awards web page at awards.tms.org to view other TMS awards and to learn more about current and past recipients.

Already familiar with TMS’s offerings? New honors will be available in 2020. Look to other articles in the March, 2019, issue of *JOM* to learn more about these new opportunities to distinguish yourself and your peers.

EPD TECHNOLOGY AWARD

Conferred on a paper that represents a notable contribution to the advancement of the technology of extraction and processing metallurgy, with emphasis on nonferrous metals.



Adam Gesing



Subodh Das

Adam Gesing, President, Gesing Consultants Inc.; and Subodh Das, CEO & Founder, Phinix LLC

Paper: "Use of Thermodynamic Modeling for Selection of Electrolyte for Electrefining of Magnesium from Aluminum Alloy Melts," *Metallurgical and Materials Transactions B*, February 2017.

"This award is a very welcome peer validation of our scientific work that we were able to do in collaboration with the FactSage thermodynamic modeling group at École Polytechnique and with the Materials and Electrochemical Research Corporation for electrochemical experimentation," noted Gesing. Das reflected, "During my more than 40 years associated with TMS, I have made and built many professional and personal contacts and relationships which have immensely benefited my personal and professional career and enhanced technical and market knowledge of the global aluminum industry."

EPD PYROMETALLURGY BEST PAPER AWARD

Recognizes individual excellence of a paper published in the proceeding volume of the EPD pyrometallurgy symposium from the previous year.

Ata Fallah-Mehrjardi, Senior Manager, Aurubis AG; Taufiq Hidayat, University of Queensland; Peter Hayes, Professor and Program Leader, University of Queensland; and Evgueni Jak, Professor, University of Queensland

Paper: "Experimental Investigation of Gas/Slag/Matte/Tridymite Equilibria in the Cu-Fe-O-S-Si System in Controlled Gas Atmosphere: Experimental Results at 1523 K (1250 °C) and $P(\text{SO}_2) = 0.25 \text{ atm}$," *Metallurgical and Materials Transactions B*, April 2018.

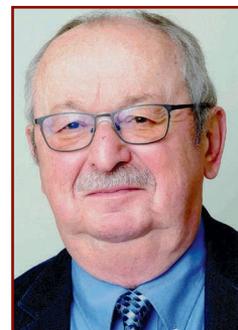
"I am glad some years of spending time in research has been recognized by the science community, and I appreciate the selection of my paper for the Best Paper Award," noted Fallah-Mehrjardi.

NAGY EL-KADDAH AWARD FOR BEST PAPER IN MHD IN MATERIAL PROCESSING

Awarded through the EPD, this award honors the memory of Professor Nagy El-Kaddah for his contributions in the field of material processing by recognizing an original contribution to the field of magnetohydrodynamic (MHD) material processing.



Lukas Dion



Laszlo Kiss



Sandor Poncsak



Charles-Luc Lagace

Lukas Dion, Research Scientist, Rio Tinto; Laszlo Kiss, Professor, University of Quebec at Chicoutimi; Sandor Poncsak, Research Professor, University of Quebec at Chicoutimi; and Charles-Luc Lagace, Lean Expert, Masonite International

Paper: "Simulator of Non-homogenous Alumina and Current Distribution in an Aluminum Electrolysis Cell to Predict Low-Voltage Anode Effects," *Metallurgical and Materials Transactions B*, April 2018.

"TMS is the best known publication platform in the aluminum industry and being recognized for my work from this organization is a great honor," noted Dion. Kiss stated, "This award for Best Paper recognizes our work in the field of aluminum electrolysis. I am proud of my coworkers, this is a great honor for all of us." "TMS is a nice platform to share our latest findings and to exchange ideas with colleagues working on the same field," added Poncsak. Lagace reflected, "This award is the accomplishment of an extraordinary collaboration between industry and university."

**FUNCTIONAL MATERIALS DIVISION (FMD)
JOHN BARDEEN AWARD**

This award is presented to an individual who has made outstanding contributions to and is a leader in the field of electronic materials.



Eric Chason, Professor, Brown University
Citation: *For pioneering contributions to understanding how stresses develop in thin films, using theory and innovative measurement science to reveal processes happening at multiple length scales.*

FMD DISTINGUISHED SERVICE AWARD

This award recognizes an individual whose continuous service to the FMD activities has clearly facilitated the society’s capability to serve its FMD members and their supporting organizations.



Tae-Kyu Lee, Associate Professor, Portland State University
Citation: *For altruistic service to the community of researchers of lead-free solder, interconnects, and packaging by catalyzing rapid dissemination between industry and academia of important advances.*

**LIGHT METALS DIVISION (LMD)
DISTINGUISHED SERVICE AWARD**

Award recipients are individuals whose continuous service to the LMD activities has facilitated TMS’s capability to serve its light metals-oriented members and their supporting organizations.



Barry Sadler, Managing Director, Net Carbon Consulting Pty Ltd.
Citation: *For advancing the role of TMS through his many contributions of time and effort as an author, organizer, and instructor.*

“Thank you to the LMD for this recognition of my service,” stated Sadler. “Throughout my career, the recognition I have valued most is that provided by my peers, so receiving the Distinguished Service Award has special personal significance. Involvement in TMS

activities since 1987 has been enormously rewarding to me personally and professionally, especially in enabling me to develop a network of international associates that I treasure. My volunteer work with TMS is a way of partly repaying these benefits.”

LMD LIGHT METALS AWARD

Awarded to the author(s) of a paper presented in the preceding year’s volume of *Light Metals*, which notably exemplified the solution of a practical problem. Distinguished from the Light Metals Subject Award Best Papers, the Light Metals Award is the paper selected as having the highest rank of the Subject Award Papers for that year.



Jean-Louis Achard



Fabio Taina



Pierre Le Brun



Pierre-Yves Menet

Jean-Louis Achard, R&D Technician, Constellium Technology Center; Fabio Taina, Metallurgy and Quality Manager, Constellium Issoire; Pierre Le Brun, Technical Expert, Constellium Technology Center; and Pierre-Yves Menet, R&D Group Manager, Constellium Technology Center
Paper: “An Innovative Ultrasonic Technology for the Continuous Quality Monitoring of Liquid Aluminum on Casting Lines”

“It’s a strong recognition for a long and laborious work,” reflected Achard. “This award represents the accomplishment of an innovative research project handled by a team composed of experts in industrial process, liquid metal treatment, and non-destructive testing,” added

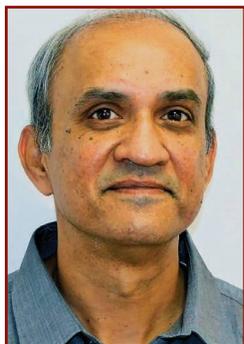
Taina. Le Brun observed, "Being a member of TMS for many years allowed me to be in contact with colleagues throughout the world, to keep up to date with new research activities, and to network with academia and industry." Menet noted, "TMS is for our profession an important institution as it offers a great opportunity for sharing knowledge and develop professional networks." **Note:** This paper also earned the Light Metals Subject Award-Warren Peterson Cast Shop for Aluminum Production.

LMD JOM BEST PAPER AWARD

This award recognizes the author(s) for excellence of a paper published in the preceding year's volume of *JOM* under a light metals related technical topic.



Gregory Smith



Sanjay Sampath

Gregory Smith, Researcher, Naval Research Laboratory; and Sanjay Sampath, Distinguished Professor and Director, Stony Brook University
Paper: "Sustainability of Metal Structures via Spray-Clad Remanufacturing," *JOM*, April 2018.
 "We are grateful to the *JOM* awards committee for selection of our paper," stated Sampath. "*JOM* is an outstanding journal with a large number of excellent publications and getting recognized is an honor. We believe our paper about approaches for sustainable remanufacturing of metals is very timely given the challenges the world faces in terms of resource utilization, energy consumption and environmental management. *JOM* will provide a broad exposure to our concepts and potentially lead to applications based on the concepts described in our paper. We thank *JOM* and TMS for this distinct honor and look forward to our continued interaction with the journal and the Society."

MATERIALS PROCESSING & MANUFACTURING DIVISION (MPMD) DISTINGUISHED SCIENTIST/ENGINEER AWARD

This award recognizes an individual who has made a long lasting contribution to design, syntheses, processing, and performance of engineering materials, with significant industrial applications.



David Furrer, Senior Fellow, Pratt & Whitney

Citation: *For pioneering contributions to the development and implementation of ICME technology, tools, and methods for the introduction of new materials and manufacturing processes.*

STRUCTURAL MATERIALS DIVISION (SMD) DISTINGUISHED SCIENTIST/ENGINEER AWARD

Recognizes long-lasting contributions to the fundamental understanding of microstructure, properties, and performance of structural materials for industrial applications.



Ricardo Lebensohn, Scientist 5, Los Alamos National Laboratory

Citation: *For pioneering work in the field of multiscale modeling of materials and its connection with the characterization of microstructure by x-ray diffraction.*

"Being recognized by our flagship materials society and joining the list of such prestigious past recipients renew my strength in pursuit of scientific progress in terms of theoretical and numerical formulations for modeling and interpretation of verified and reproducible experimental evidence," noted Lebensohn. "I am very grateful to my SMD peers who, through this award, recognize my contributions to the field of modeling mechanical behavior of materials. These advances were enabled throughout my career by multiple collaborations with excellent mentors, colleagues and mentees, and by institutional support from Los Alamos National Laboratory."

SMD JOM BEST PAPER AWARD

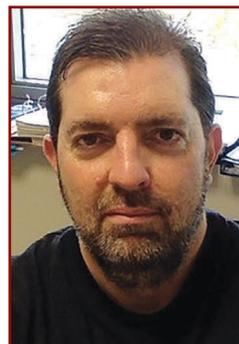
This award recognizes the author(s) for excellence of a paper published in the preceding year's volume of *JOM* under a structural materials related technical topic.

Jeremy Snel, *Business Development Manager, LEITAT Technological Center*; **Miguel Alberto Monclus**, *Research Associate, IMDEA Materials Institute*; **Miguel Castillo-Rodriguez**, *Instrument Scientist, IMDEA Materials Institute*; **Nathan Mara**, *Associate Professor, University of Minnesota*; **Irene J. Beyerlein**, *Professor, University of California, Santa Barbara*; **Javier Llorca**, *Professor, IMDEA Materials Institute*; and **Jon Molina-Aldareguia**, *Senior Researcher, IMDEA Materials Institute*

Paper: "Deformation Mechanism Map of Cu/Nb Nanoscale Metallic Multilayers as a Function of Temperature and Layer Thickness," *JOM*, November 2017.



Jeremy Snel



Miguel Alberto Monclus



Nathan Mara



Irene J. Beyerlein



Javier Llorca



Jon Molina-Aldareguia

LIGHT METALS SUBJECT AWARDS

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

Alumina/Bauxite

Panagiotis Davris, *Aluminium of Greece*; Efthymios Balomenos, *Senior Researcher/External Associate, National Technical University of Athens/ Mytilineos S.A.*; Dimitrios Pantias, *Professor, National Technical University of Athens*; and Ioannis Paspaliaris, *Professor, National Technical University of Athens*

Paper: "Developing New Process for Selective Extraction of Rare Earth Elements from Bauxite Residue Based on Functionalized Ionic Liquids," *Light Metals 2018*.

Aluminum Alloys

Tao Liu, *Graduate Research Assistant, University of Alabama*; Sydney Morales, *Student, University of Alabama*; Mikko Karkkainen, *Student, University of Alabama*; Luke N. Brewer, *Associate Professor, University of Alabama*; Laurentiu Nastac, *Professor, University of Alabama*; Vishweshwar Arvikar, *Senior Process Engineer, Nemak Alabama*; and Ilya Levin, *Site Metallurgist, Nemak Alabama*

Paper: "The Combined Effects of Sr Additions and Heat Treatment on the Microstructure and Mechanical Properties of High Pressure Die Cast A383 Alloy," *Light Metals 2018*.

Aluminum Reduction Technology

Grant J. McIntosh, *Principal Chemist/Research Fellow, University of Auckland*; Hasini Wijayaratne, *Research Engineer, University of Auckland*; Gordon E.K. Agbenyegah, *Ph.D. Candidate, University of Auckland*; Margaret M. Hyland, *Vice-Provost Research, Victoria University of Wellington*; and James B. Metson, *Deputy Vice Chancellor of Research, University of Auckland*

Paper: "Impacts of Sodium on Alumina Quality and Consequences for Current Efficiency," *Light Metals 2018*.

Electrode Technology for Aluminum Production

Bruno Rausch, *Principal Engineer, Hydro Aluminium Deutschland GmbH*; Juraj Chmelar, *Area Manager Process, Hydro Aluminium AS*; Hogne Linga, *Consultant*; Lorentz Petter Lossius, *Principal Engineer, Hydro Aluminium AS*; Rebecca J. Thorne, *Researcher, Norwegian Institute for Air Research*; and Viktorija Tomkute, *Project Engineer, Hydro Aluminium AS*

Paper: "Interaction of Anode Aggregate and Binder in the Sessile Drop Wetting Test," *Light Metals 2018*.

LMD MAGNESIUM TECHNOLOGY AWARDS

The following awards celebrate the 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

Raymond Decker, *Chief Technical Officer, Thixomat/nanoMAG, LLC*; Stephen LeBeau, *President, nanoMAG, LLC*; Daniel LaCroix, *Student, Michigan Technological University*; Surendra Makineni, *Postdoctoral Research Fellow, Max Planck Institute for Iron Research*; and John Allison, *Professor, The University of Michigan*
Paper: "Development of BioMg® 250 Bioabsorbable Implant Alloy," *Magnesium Technology 2018*.

Fundamental Research

Huimin Lu, *Professor, Beihang University*; and Guangzhi Wu, *Chairman, Inner Mongolia Xintai Construction and Installation Group Co., Ltd.*
Paper: "Study on the production of Metallic Magnesium from Nickel – Containing Serpentine," *Magnesium Technology 2018*.

Student Paper

Charlotte Wong, *Student, RMIT University*; Mark J. Styles, *Research Scientist, CSIRO Manufacturing*; Suming Zhu, *Senior Research Fellow, RMIT University*; Trevor Abbott, *Director - Research & Development, Magontec Limited*; Kazuhiro Nogita, *Professor, University of Queensland*; Stuart D. McDonald, *Senior Research Fellow, University of Queensland*; David St. John, *Professor Emeritas, University of Queensland*; Mark A. Gibson, *Honorary Fellow, CSIRO Manufacturing*; and Mark Easton, *Professor, RMIT University*

Paper: "Experimental Study of the Solidification Microstructure in the Mg-Rich Corner of the Mg-Al-Ce System," *Magnesium Technology 2018*.

Best Poster

Zhijia Huang, *Student, University Of Michigan*; John Allison, *Professor, University of Michigan*; and Amit Misra, *Professor, University of Michigan*
Title: "Interaction of Glide Dislocations with Extended Precipitates in Mg-Nd Alloys"

LMD/EPD SUBJECT AWARDS

These awards recognize the individual excellence of a paper within the recycling subject area presented the preceding year in a Light Metals or EPD-sponsored session at the annual meeting.

Recycling

Jan Steglich, *Project Manager R&D, TRIMET Aluminium SE*; Christiane Matthies, *TRIMET Aluminium SE*; Marcel Rosefort, *Head of R&D, TRIMET Aluminium SE*; and Bernd Friedrich, *RWTH Aachen University*

Paper: "Behavior of Mg-Si-Rich Phases in Aluminum Can Sheets and Their Impact on Metal Oxidation during Industrial Thermal Pre-treatment," *Light Metals 2018*.

Thomas Boundy, *Student, Colorado School of Mines*; and Patrick Taylor, *Professor, Colorado School of Mines*

Paper: "Towards Commercialization of Indium Recovery from Waste Liquid Crystal Display Screens," *Energy Technology 2018*.

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

Xia Lou, Professor, Curtin University; and Hossein Dashti, Ph.D. Candidate, Curtin University

Paper: “Gas Hydrate-based CO₂ Separation Process: Quantitative Assessment of the Effectiveness of Various Chemical Additives Involved in the Process,” *Energy Technology 2018*.

Lou reflected, “This is a great honor from the membership. It is an excellent recognition of quality research and great encouragement to the researchers, especially for young and early career researchers.”

Student

Mengqi Wei, Student, Jiangsu Provincial Academy of Environmental Science; Qingbo Yu, Professor, Northeastern University; Qiang Guo, University of

Waterloo; Zongliang Zuo, Student, Northeastern University; and Qin Qin, Vice-Professor, Northeastern University

Paper: “Preparation and Characterization of Activated Carbon from Waste Ion-Exchange Resin for CO₂ Adsorption,” *Energy Technology 2018*.

“Thank you for giving us the opportunity to learn and communicate with the experts,” reflected Wei. “This award is an affirmation of our present work and the research of the CO₂ emission reduction,” observed Yu. “I am very glad and proud to have received this award,” noted Guo. “Thank you for giving us the opportunity to learn and communicate with peer experts,” added Zuo. “This award is the recognition of my present work and the research of this field. Further research in this field will be carried out for the forthcoming period,” stated Qin.

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

Mingming Zhang, Lead Research Engineer, ArcelorMittal Global R&D; Udaya Bhaskar Kodukula, Lead Engineer, ArcelorMittal Global R&D; and Marcelo Andrade, Ironmaking Manager, ArcelorMittal Global R&D

Paper: “Characterization of HPGR Pre-treated Sinter Feed,” *Characterization of Minerals, Metals, and Materials 2018*.

Best Paper Award – Second Place

Zheng Wei, Chongqing University; Tao Li, Chongqing University; Xueli Cao, Fujian Institute of Research on the Structure; Hanying Wen, Chongqing University; Guodong Shi, Chongqing University; Lei Yu, Chongqing University; Lin Zhu, Chongqing University; Wen-xin Tang, Chongqing University; Meng Li, Chongqing University; and Chenguang Bai, Chongqing University

Paper: “Applications of Aberration-Corrected Low-Energy Electron Microscopy for Metal Surfaces,” *Characterization of Minerals, Metals, and Materials 2018*.

Best Poster Award – First Place

Mustafacan Kutsal, Student, Technical University of Denmark; Bengisu Yasar, Research Assistant, Middle East Technical University; and Yunus Eren Kalay, Associate Professor, Middle East Technical University
Title: “The Effect of Transition Metals in Devitrification of Al-TM-RE Marginal Glass Forming Alloys”

Best Poster Award – Second Place

Veeraraghavan Sundar, Technical Marketing Manager, UES Inc.; Satya RNL Ganti, Research Scientist, UES Inc.; and Bryan Turner, Materials Engineer, Materials Resources LLC
Title: “Automated Optical Serial Sectioning Analysis of Phases in a Medium Carbon Steel”

Best Poster Award – Third Place

Md Ashrafal Islam; Md Abdul Kader, Student, University of South Wales; Paul Hazell; Juan Escobedo Diaz, Lecturer-Assistant Professor, University of South Wales; and Andrew Brown
Title: “Experimental Investigation of Low-velocity Ballistic Impact Response of Closed Cell Aluminium Foams for Various Shaped Projectile Tips”





TMS meeting headlines

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

Other Meetings of Note

Offshore Technology Conference (OTC) 2019
 May 6–9, 2019
 Houston, Texas, USA

5th World Congress on Integrated Computational Materials Engineering (ICME 2019)
 July 21–25, 2019
 Indianapolis, Indiana, USA

The 10th Pacific Rim International Conference on Advanced Materials and Processing
 August 18–22, 2019
 Xi'an, China

11th International Conference on Porous Metals and Metallic Foams (MetFoam 2019)
 August 20–23, 2019
 Dearborn, Michigan, USA

2019 Liquid Metal Processing & Casting Conference (LMPC 2019)
 September 8–11, 2019
 Birmingham, United Kingdom

World Congress on High Entropy Alloys (HEA 2019)
 November 17–20, 2019
 Seattle, Washington, USA

ICTP 2020: The 13th International Conference on the Technology of Plasticity
 July 26–31, 2020
 Columbus, Ohio, USA

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



ALUMINUM CAST SHOP
 Science and Technology Course

May 6–10, 2019

The Stanley Hotel, Athens, Greece

Discount Registration Deadline:

March 29, 2019

www.tms.org/CastShop2019

- This five-day professional development opportunity is focused on key cast shop processes for primary and secondary aluminum smelters.
- The course will rely on leading experts in the field to teach participants ways to solve problems in their own cast shops, while demonstrating techniques used in plants around the world.
- The TMS Aluminum Cast Shop Science & Technology Course will feature small group sessions, networking activities, and a tour of the Aluminium of Greece plant.



CONTROL OF POTLINE SCRUBBER & FUGITIVE EMISSIONS
 for Aluminum Smelters Course

June 17–20, 2019

The Rilano Hotel Hamburg

Hamburg, Germany

Discount Registration Deadline:

May 15, 2019

www.tms.org/PSFE2019

- This four-day professional development opportunity is focused on providing a complete overview of the latest techniques for controlling and reducing emissions from the aluminum smelting process.
- The course features highly experienced, world recognized instructors, who will rely on their experiences to encompass the broadest possible scope of knowledge and ideas.
- The TMS Control of Potline Scrubber & Fugitive Emissions for Aluminum Smelters Course will include interactive sessions and a tour of the Hamburg TRIMET Aluminium plant.



TMS METALLURGICAL AND MATERIALS PROFESSIONAL ENGINEER (PE)

LICENSING EXAM REVIEW COURSE

August 14–17, 2019

TMS Headquarters Office

Pittsburgh, Pennsylvania, USA

www.tms.org/PEReview2019

- This four-day course is the only review course focused specifically on the Metallurgical and Materials Engineering Professional Engineer (PE) Licensing Exam.
- A variety of approaches and methodologies will be addressed, including design, analysis, application, and operations. The course will be structured according to the National Council of Examiners for Engineering and Surveying (NCEES) Principles and Practice of Engineering Examination Metallurgical and Materials Exam Specifications.

MS&T19

MATERIALS SCIENCE & TECHNOLOGY

September 29–October 3, 2019

Oregon Convention Center

Portland, Oregon, USA

Submit Your Abstract Now!

www.matscitech.org

- Share your work with colleagues at Materials Science & Technology 2019 (MS&T19). Submit an abstract in one of the following topic areas: Additive Manufacturing; Biomaterials; Ceramic and Glass Materials; Energy; Failure Analysis; Fundamentals and Characterization; Iron and Steel (Ferrous Alloys); Materials-Environmental Interactions; Modeling; Nanomaterials; Processing and Manufacturing; and Special Topics.
- There are still booth spaces available in the MS&T19 Exhibit Hall. This unique event is a great opportunity to get your company noticed. View the current layout map on the MS&T19 website today.



call for papers

JOM is seeking contributions on the following topics for 2019. For the full Editorial Calendar, along with author instructions, visit the JOM website at jom.tms.org.



September 2019: Manuscript Deadline: April 1, 2019

Topic: Aluminum: Recycling and Environmental Footprint

Scope: This topic covers recycling of aluminum and its alloys as well as the environmental ramifications of both primary and secondary aluminum.

Guest Editors: David Wong and Pascal Lavoie

Sponsors: Aluminum Committee and Recycling and Environmental Technologies Committee

Topic: Advanced Electronic Interconnection

Scope: Papers are invited for this special topic covering recent advances of bonding technologies for 2.5D and 3D IC, wide-band-gap (WBG) semiconductors, and flexible electronics.

Guest Editor: Shih-Kang Lin

Sponsor: Alloy Phases Committee

Topic: Advances in Processing, Manufacturing, and Applications of Magnetic Materials

Scope: Papers are invited on novel magnetic materials, advances in processing or relevant property measurement, and circular manufacturing of magnetic materials. Of interest are permanent and soft magnets and magnetocaloric materials, and also multifunctional magnetic materials such as magnetoelastic, magnetoelectric, and magnetoresistive materials.

Guest Editors: Orlando Rios and Ikenna Nlebedim

Sponsors: Magnetic Materials Committee and Energy Conversion and Storage Committee

Topic: Recycling Methods for Industrial Metals

Scope: This topic will compare recycling methods for different metals which will stimulate thinking about similarities and differences and engender improvements in recycling processes and in the use of metals.

Guest Editor: Dirk Verhulst

Sponsor: Recycling and Environmental Technologies Committee

Topic: Sustainable Pyrometallurgical Processing

Scope: Extractive metallurgy is experiencing a steady

transformation towards more sustainable processes based on alternative sources and practices. This topic covers the development of recycling and bio-based fuel technologies to meet current environmental standards as well as sourcing issues. Fields include but are not limited to: process optimization, alternative material sourcing, by-product utilization, and energy efficiency.

Guest Editors: Joseph Grogan and Camille Fleuriault
Sponsor: Pyrometallurgy Committee

Topic: Properties of Interfaced Materials and Films

Scope: This subject is open to all types of interfaces including: ultra-thin layered films, thin films on bulk materials, nanocrystals embedded in bulk materials and textured coated surfaces to name a few. This special topic focuses on research papers that address the electronic, optical, biological, magnetic, and mechanical properties of interfaced systems. It also welcomes in-situ characterization studies of interfaces, and encourages theoretical modeling approaches of interfaced materials and properties.

Guest Editors: Sufian Abedrabbo, Anthony T. Fiory, and Nugehalli M. Ravindra

Sponsor: Thin Films and Interfaces Committee

October 2019:

Manuscript Deadline: May 1, 2019

Topic: New Developments in Nanomechanical Methods

Scope: This special topic will focus on the advances used to measure mechanical properties of small-volume and low-dimensional materials, as well as bulk nanostructured materials. Of particular interest are new instrumentation, methods, and environmental control to evaluate mechanical behavior in terms of size effects, time scales, environmental testing, as well as in-situ experimental methods.

Guest Editors: Megan Cordill and Janelle Wharry

Sponsor: Nanomechanical Materials Behavior Committee

Topic: Microstructure Evolution During Deformation Processing

Scope: Understanding how deformation processing techniques can control the microstructural evolution in

metals is vital for alloy development. Processing-structure-properties-performance relationships can be created from the characterization data and, along with modeling, allow for the definition of material-specific process parameters to control the microstructural evolution and resulting material properties. Papers are invited that investigate all these aspects of microstructural evolution during deformation processing.

Guest Editor: Daniel Coughlin

Sponsors: Shaping and Forming Committee and Advanced Characterization, Testing, and Simulation Committee

Topic: Progress in High-Entropy Alloys

Scope: High-entropy alloys (HEAs) loosely refer to multi-principal-element solid solution alloys due to their high configurational entropy. The unique compositions and the resulting attractive properties of HEAs have stimulated growing research interest due to scientific curiosity and potential industrial applications. This special topic on high-entropy alloys invites contributions from authors working in the various fields of HEAs to disseminate the rapid progress in this fascinating and expanding class of advanced materials.

Guest Editors: Chuang Zhang, Michael C. Gao, and Shih-Kang Lin

Sponsor: Alloy Phases Committee

Topic: Modeling and Simulation of Composite Materials

Scope: Progress in micro- and nanoscale composites has resulted in the development of a number of computational methods to address various length-scale phenomena in composites. This topic will highlight modeling and simulation currently used in advancing the understanding of the complex interactions and structure-property relationship in composite materials by ab-initio methods, atomistic methods, mesoscale simulations, finite element methods, and multi-scale modeling.

Guest Editors: Rakesh Behera, Dinesh Pinisetty, and Dung Luong

Sponsor: Composite Materials Committee

Topic: Mesoscale Materials Science: Experiments and Modeling

Scope: Many in-situ techniques have been developed to probe materials at the mesoscale. At the same time, availability of faster and cheaper computational power lead to the development of high fidelity, mesoscopic models. This topic invites contributions in the area of advanced mechanical testing, enhancements in computational approaches, and integration of experiments and modeling for engineering the evolution of mesoscopic structures and defects.

Guest Editors: Saurabh Puri and Amit Pandey

Sponsor: Invited

November 2019:

Manuscript Deadline: June 1, 2019

Topic: Advanced Characterization and Testing of Irradiated Materials

Scope: This special topic focuses on the characterization and testing of radiation-affected materials through scanning and transmission electron microscopy, atom probe tomography, micro-mechanical testing, x-ray diffraction, etc.

Guest Editors: Dhriti Bhattacharyya, Fan Zhang, and Peter Hosemann

Sponsors: Advanced Characterization, Testing, and Simulation Committee and Nuclear Materials Committee

Topic: Solid Oxide Fuel Cells: Recent Scientific and Technological Advancements

Scope: Relevant topics include understanding and enhancement of the oxygen reduction reaction at the cathode; understanding and mitigation of chromium poisoning of cathodes; enhancing the stability, electrochemical activity, and sulfur tolerance of anodes; new materials and processing techniques for electrolytes; enhancing interfacial stability between electrodes and electrolyte; advanced materials and coatings for interconnections and balance of plant; and materials and techniques for improved fuel processing.

Guest Editors: Soumendra Basu and Amit Pandey

Sponsor: Energy Conversion and Storage Committee

Topic: Crystal Orientation Dependence of Mechanical and Thermal Properties in Functional Nanomaterials

Scope: The emphasis of this special topic will be on the latest advances in the investigation and understanding of various crystal orientation phenomena toward functional nanomaterials design, and characterization in single-crystal, bicrystal, and polycrystalline metallic, ceramic, oxide, composite materials, etc. using theoretical, computational, and experimental methods.

Guest Editors: Ning Zhang and Chang-Yong Nam

Sponsor: Nanomaterials Committee

Topic: Progress with Lead-Free Solders

Scope: Pb-free solders are now in widespread use and can out-perform Pb-based materials in many applications. Despite this success, there is an ongoing need to develop next-generation interconnection materials for smaller joints that can operate in more extreme environments and that are more reliable. This topic covers recent advances in solder alloy design for harsh environments, new interconnection materials and bonding technologies, and advances in the understanding of electronics reliability.

Guest Editors: Chris Gourlay and Babak Arfaei

Sponsor: Electronic Packaging and Interconnection Materials Committee

Topic: Ceramic Materials for Nuclear Energy Applications

Scope: Ceramic materials play a critical role in nuclear energy for their applications as fuels, claddings, and waste forms. This topic covers experimental and computational studies of ceramics, both practical reactor materials and surrogate material, for nuclear energy research and applications. Papers of interest include, but are not limited to, fabrication, microstructure characterization, measurement and computation of properties, and degradation in operating conditions.

Guest Editors: Yongfeng Zhang and Xian-Ming Bai

Sponsor: Nuclear Materials Committee

UPCOMING TMS MEETINGS

For a complete listing of TMS meetings, visit: www.tms.org/Meetings



July 21–25, 2019
Indianapolis, Indiana, USA • www.tms.org/ICME2019



August 20–23, 2019
Dearborn, Michigan, USA • www.tms.org/MetFoam2019



September 8–11, 2019
Birmingham, United Kingdom • www.tms.org/LMPC2019



September 29–October 3, 2019
Portland, Oregon, USA • www.matscitech.org



November 17–20, 2019
Seattle, Washington, USA • www.tms.org/HEA2019



February 23–27, 2020
San Diego, California, USA • www.tms.org/TMS2020



July 26–31, 2020
Columbus, Ohio, USA • www.tms.org/ICTP2020



September 13–17, 2020
Seven Springs, Pennsylvania, USA
www.tms.org/Superalloys2020



October 4–8, 2020
Pittsburgh, Pennsylvania, USA • www.matscitech.org

Thermo-Calc Software

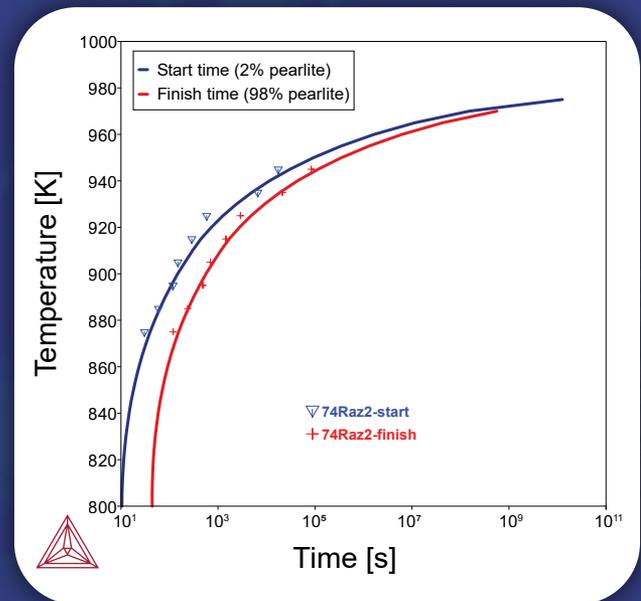
Powerful Software for Thermodynamic and Diffusion Calculations

Software packages:

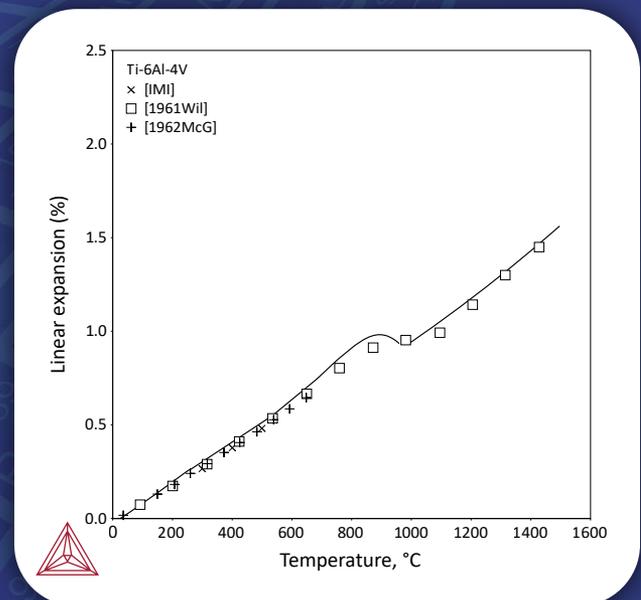
- ✓ **Thermo-Calc** for thermodynamics and phase equilibria in multicomponent systems
- ✓ **Diffusion module (DICTRA)** for modelling diffusion controlled transformations
- ✓ **Precipitation module (TC-PRISMA)** for modelling precipitation kinetics
- ✓ **Software development kits** for linking Thermo-Calc to your own software codes
- ✓ **Over 40 Databases** for thermodynamic and mobility applications

Highlights of 2019a release:

- ✓ **New Martensite + Pearlite Models** - calculate M_s and M_f temperatures and predict pearlite growth kinetics
- ✓ **New TC-Python API** - link Thermo-Calc, DICTRA and TC-PRISMA to other packages using the easy to learn Python language
- ✓ **New Databases TCT12, TCNI9, TCAL6** - Major updates to the Titanium, Nickel and Aluminum thermodynamic databases and their corresponding mobility databases



TTT diagram calculated using the new Steel Pearlite Model



Linear expansion rate for Ti-6Al-4V

Thermo-Calc 2019a now available:

Visit www.thermocalc.com/release to learn about the new features and databases or stop by Booth 312 at the TMS 2019 Annual Meeting and Exhibition (March 11-13, 2019)

www.thermocalc.com/release

info@thermocalc.com