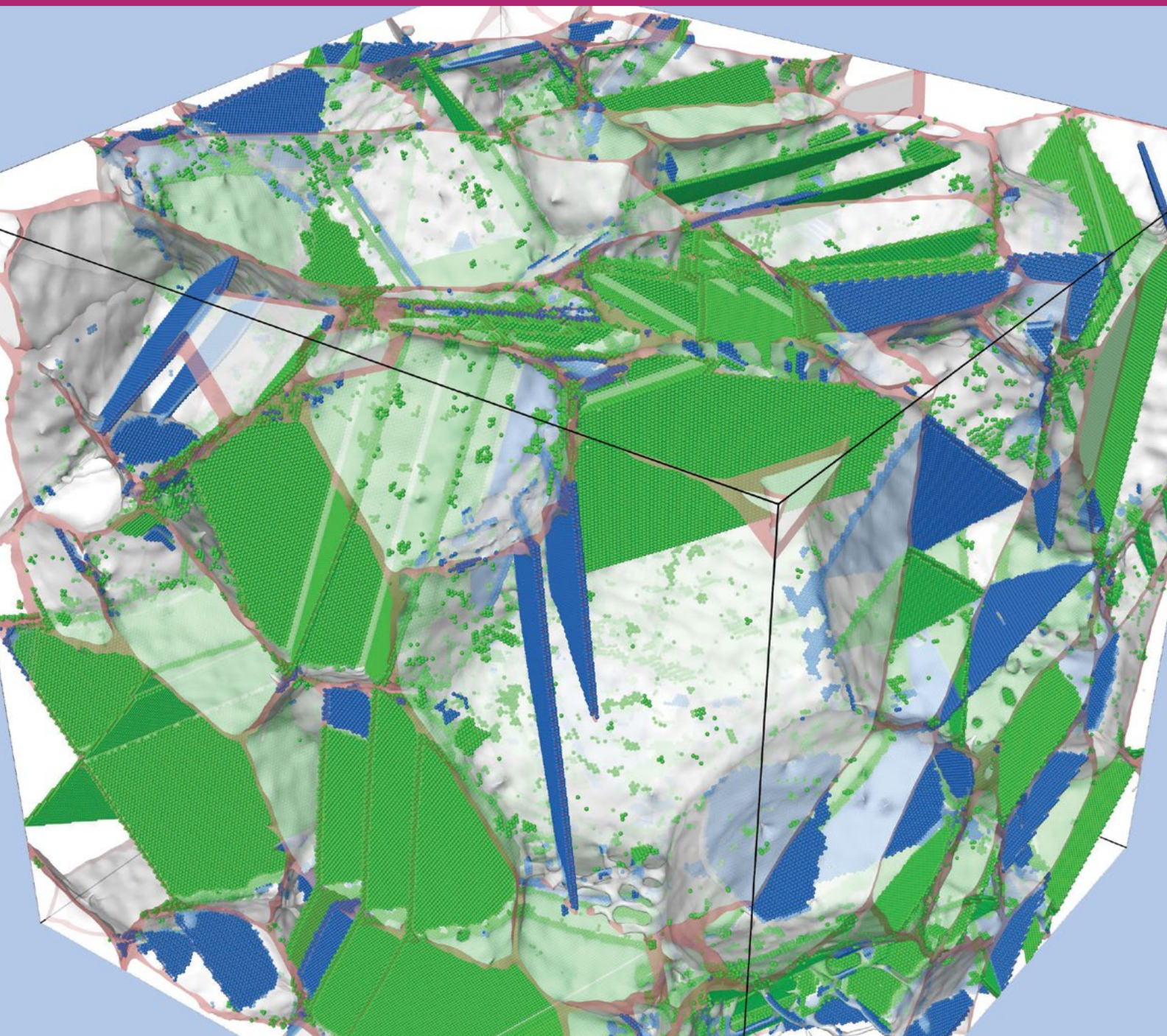


# JOM

APRIL 2020

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An official publication of The Minerals, Metals & Materials Society



**EXPLORE ICTP 2020: Preview the Conference Program and Activities**

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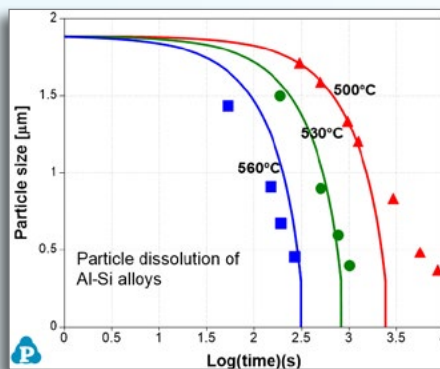
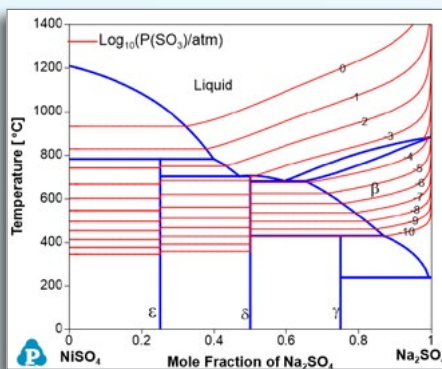
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## About the Cover

Nanocrystalline materials are known to undergo microplasticity (i.e., inelastic behavior) within grain boundaries prior to macroscopic yielding. The cover image, from “Grain-Size Dependent Grain Boundary Deformation During Yielding in Nanocrystalline Materials using Atomistic Simulations” by Satish S. Rajaram et al. shows dislocation activity of a 20 nm average grain size nickel structure undergoing 5% imposed strain. Atoms colored green and blue represent perfect and partial dislocations, respectively. Dislocation activity decreases with grain size, corresponding to changes in microplastic accumulation prior to yielding. Larger structures exhibit more homogenous inelastic grain boundary displacement, while smaller ones show localized inelastic behavior. Visualization was performed using OVITO (<https://www.ovito.org>).



## April 2020 Guest Editors

### Advanced Manufacturing for Biomaterials and Biological Materials: Part II 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

### Aluminum and Magnesium: New Alloys and Applications Aluminum Committee

Dmitry Eskin, Brunel University

### Characterization of Advanced Biomaterials

Materials Characterization Committee

Zhiwei Peng, Central South University

Rajiv Soman, Eurofins EAG Materials Science LLC

Yunus Eren Kalay, Middle East Technical University

## 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

*“What kind of sad creature considers occupational licensing a hot topic?”*

—Michelle Cottle in *The Atlantic*

Count me as one such a creature because many TMS members are passionate about professional licensing for engineers. The professional engineering (P.E.) designation means a lot in this community, and it is perceived as essential in many consulting and governmental sectors. The practice is literally and figuratively part of our infrastructure, yet it has become a contentious issue in state capitols across the country. Why? Perhaps because lawmaking can be a blunt-force instrument rather than a delicate tool.

How does licensure work? As with most things (everything?), I’m not an expert, but my understanding is this: There are effectively two types of licensure—licenses for those whose work requires considerable education and can have catastrophic consequences if performed ineptly (physicians, engineers, accountants, etc.) and those that require occupational or vocational training so as to competently deliver a particular service (beauticians, cab drivers, and so on). The process is governed at the state level. What occupations are required to have a license and how that license is issued will vary from state to state and job to job. While there’s a big difference between the risk of having a bridge fall down and the risk of getting a bad hair cut, the licensure process attempts to safeguard the public against both extremes.

So what’s the issue? There’s often wide variability from state to state on what occupations require licensure, what the licensure requirements are, and how much the license costs. Famously, the Obama and Trump administrations have few policy commonplaces, but both have supported reform to the licensure system so as to reduce costs and restrictions.

One organization trying to advance a minimalist licensure agenda is the American Legislative Exchange Council. It provides groups advocating change with model legislation to propose to state legislatures. An excerpt: “The Purpose of the Act is to: (A) Protect workers from unnecessary and burdensome licensing regulations; (B) Increase market competition by allowing consumers to make informed decisions in hiring the workers they choose; (C) Empower industry groups, trade organizations, and similar private associations to self-regulate without the participation of government; and (D) Make regulators more efficient by shifting resources away from enforcing occupational licensure to better focus on regulating for the purposes of protecting health and safety through different types of regulation.” Maybe this is reasonable for manicurists but is it right for engineers?

TMS is a staunch advocate of professional registration in the engineering field and does this through a network of collaborative relationships. Here’s how: TMS is a member of the Participating Organizations Liaison Council of the National Council of Examiners for Engineering and Surveying. NCEES exists to “advance licensure for engineers and surveyors in order to safeguard the health, safety, and welfare of the public.” They coordinate with state licensure bodies and professional societies to bring uniformity to the process. Within NCEES, TMS has responsibility for the metallurgical and materials engineering P.E. area, and TMS volunteers work through our Professional Registration Committee. NCEES is part of the larger Alliance for Responsible Professional Licensing, a newly formed advocacy group that aims “to educate policymakers and the public on the importance of high standards, rigorous education, and extensive experience within highly complex, technical professions that are relied upon to protect public safety and enhance public trust.” Nutshell: They advocate that states refrain from weakening or eliminating licensing standards for the technical community.

Reasonable people can disagree reasonably yet find reasonable solutions to their disagreements. The reasonable advocacy position seems to be that while the licensure system may need some adjustment, the engineering community already has a solution in place that assures integrity and safety to the public. Sounds like something engineers would do.

# JOM

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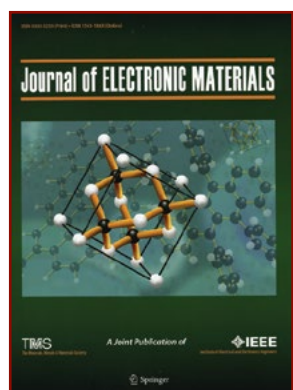
April 2020



James J. Robinson  
Executive Director

[@JJRofTMS](https://twitter.com/JJRofTMS)

*“TMS is a  
staunch advocate  
of professional  
registration in the  
engineering field  
and does this  
through a network  
of collaborative  
relationships.”*



## Submit Papers for JEM Perovskite Collection; Apply to Attend 2020 ELA Conference

### member news

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

### Journal of Electronic Materials Seeks Submissions for Topical Collection

A special topical collection, **Progress and Challenges with Stability, Sustainability, Toxicity, and Scalability of Perovskite Materials and Devices**, planned for the *Journal of Electronic Materials (JEM)*, is now accepting submissions. Papers are due by **May 1, 2020**.

The collection is broadly devoted to the science and technology of perovskites, with special emphasis on stability, sustainability, toxicity, and scalability of perovskite materials and devices. While all perovskite-related contributions are welcome, the following areas are of special interest for this collection:

- Susceptibility to ambient environment resulting from insufficient encapsulation
- Material chemical stability due to inhibition of light-induced decomposition
- Energy losses in the bulk of the material, as well as at the surface and interfaces

- Free exciton trapping and luminescence quenching
- Control of nucleation and rapid crystallization by modulating growth conditions
- New insight on structure–properties–performance relationships
- Theoretical modelling, first-principles calculations, and machine-learning discovery

Submissions will be considered for three types of articles: original research, review articles, and short letters. To submit your work, go to [www.editorialmanager.com/jems](http://www.editorialmanager.com/jems) and select article type “2020 Perovskite Materials and Devices.” Author instructions and additional journal details are available at [www.springer.com/11664](http://www.springer.com/11664).

The guest editors of this topical collection are: Wojciech M. Jadwisieniczak, Ohio University, Faiz Rahman, Ohio University, and Dan Ricinschi, Tokyo Institute of Technology.

### TMS Members Attend ELA

TMS was proud to send six members to the 2019 Emerging Leaders Alliance (ELA) conference, held November 3–6, in Falls Church, Virginia. Registration is provided each year for up to eight individuals by the TMS Foundation. Attending the 2019 program through Foundation scholarships were: Gordon Agbenyegah, University of Auckland; Youxing Chen, University of North Carolina at Charlotte; Danielle Cote, Worcester Polytechnic Institute; Siddhartha Pathak, University of Nevada, Reno; Eric Tower, Pyrotek; and Emma White, Ames Laboratory.

The ELA is a multi-society initiative that provides an inter-disciplinary community of learning for engineering and scientific professionals. The intent of the program is to strengthen nontechnical skills in a setting that allows attendees to obtain foundational, executive-level knowledge while weaving themes of social responsibility and environmental stewardship throughout the training curriculum.

TMS is now accepting applications for the next ELA conference, scheduled for September 20–23, 2020. Applicants must



be TMS members, typically ages 24–40, with rising or current leadership positions in their organizations. To apply for a seat at the 2020 conference, interested individuals should send a letter of interest, one or two letters of recommendation, and a resume or curriculum vitae to Deborah Hixon, TMS Awards Program Administrator, at [hixon@tms.org](mailto:hixon@tms.org). **The deadline to apply is June 15, 2020.**

More established TMS members can support future leaders by donating to the TMS Foundation. Any level of contribution helps ensure that future leaders of the minerals, metals, and materials community have access to this unique and valuable program, in addition to other Foundation activities initiatives geared toward developing early career professionals. Visit [www.TMSFoundation.org](http://www.TMSFoundation.org) to make a donation.



Attending the 2019 Emerging Leaders Alliance conference from TMS were: (back row, left to right) Eric Tower, Pyrotek; Siddhartha Pathak, University of Nevada, Reno; Danielle Cote, Worcester Polytechnic Institute; Daniel East, CSIRO; and Youxing Chen, University of North Carolina at Charlotte; (front row, left to right) Gordon Agbenyegah, University of Auckland; and Emma White, Ames Laboratory.

## A New Look at Tech Innovations from Ainissa Ramirez

Science communicator, materials scientist, and TMS member Ainissa Ramirez authored a new book, available in April 2020, titled, *The Alchemy of Us: How Humans and Matter Transformed One Another*. Through her exploration of the stories and people behind eight inventions, Ramirez offers a unique perspective on human relationships with technology throughout history. The book summary notes: "...Ramirez showcases little-known inventors—particularly people of color and women—who had a significant impact but whose

accomplishments have been hidden by mythmaking, bias, and convention. Doing so, she shows us the power of telling inclusive stories about technology."

Among her many professional achievements, Ramirez received the American Association of Engineering Societies (AAES) 2017 Norm Augustine Award for Outstanding Achievement in Engineering Communications. TMS nominated her for the award through the American Institute of Mining, Metallurgical, and Petroleum Engineers (AIME), and AAES member society.



**Ainissa Ramirez**

## Gregory Olson Named to New Professorship

Thermo-Calc Software announced a new professorship—the Thermo-Calc Professor of the Practice—at the Massachusetts Institute of Technology (MIT), naming Gregory B. Olson to the position. Olson, co-founder of QuesTek Innovations, was previously a faculty member at Northwestern University for more than 30 years, most recently as the Walter P. Murphy Professor of Materials Science and Engineering. Olson began the new position in MIT's Department of Materials Science and Engineering in January 2020.

The professorship melds industry and academia, with the goal of providing

"practical experience at a high level in the area of computational materials science," according to Thermo-Calc. The company also noted that Olson was selected because of his experience and commercial success in industry with QuesTek, where he used computational tools to develop systems for rapid materials design.

A TMS member since 1986, Olson is a 2001 TMS Fellow and has received the 2004 Structural Materials Division Distinguished Scientist/Engineer Award and the 2014 Morris Cohen Award from the Society. He was also elected to the National Academy of Engineering in 2010.



**Gregory B. Olson**



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](mailto:kcalva@tms.org) for consideration.

## In Case You Missed It: Business News from the Field

### BFF Prints Human Heart Cells in Space

**Greenville, Indiana, USA:** A 3D bioprinter successfully manufactured a large volume of human heart cells aboard the International Space Station (ISS) U.S. National Laboratory. The 3D BioFabrication Facility (BFF), owned by Techshot Inc., a commercial operator of microgravity research and manufacturing equipment, was developed in partnership with nScript, a manufacturer of industrial 3D bioprinters and electronics printers. Following the next round of test prints, Techshot expects BFF to be ready for use by industrial and institutional life science customers.

### Alianza and Coeur Partner to Explore Yukon

**Vancouver, Canada:** Canadian exploration company Alianza Minerals Ltd. signed an option agreement with U.S.-based Coeur Mining Inc. to explore the Tim Silver property in Yukon, north-western Canada. The exploration will target high-grade silver-lead mineralization similar to that found in the nearby Silvertip

mine acquired by Coeur in October 2017. Starting in 2020, the project will conduct detailed mapping, geochemical soil surveys, and the reopening of old trenches. According to the agreement, Coeur could earn 80% interest in

the property by funding \$3.55 million in exploration over the course of five years and by making cash payments that total \$575,000 over eight years.

### Veolia Expands Waste Capabilities

**Boston, Massachusetts, USA:** Veolia ES Technical Solutions LLC purchased Elemental Environmental Solutions LLC from Alcoa Corporation. Elemental Environmental Solutions currently treats a byproduct of the electrolytic process that separates elemental aluminum from aluminum oxide at its 1,300-acre hazardous waste treatment business in Gum Springs, Arkansas. The incinerator and landfill on site are permitted for the treatment and disposal of broad categories of liquid and solid hazardous wastes. The site will remain a service provider to Alcoa.

### Telson Reopens Campo Morado Mine

**Vancouver, Canada:** Telson Mining Corporation resumed full-scale mining and milling in January 2020 at its Campo Morado polymetallic mine in Guerrero, Mexico. The company had suspended operations in August 2019 due to a decline in community relations and the price of zinc. Production began at about 1,750 tons per day (tpd) and is intended to increase towards 2,000 tpd. Telson also is working to complete the Tahuehueto gold-silver-lead-zinc project in Durango, Mexico, and hopes to finish construction in 2020.

### Steel Production Increases Worldwide

**Brussels, Belgium:** Global crude steel production increased by 3.4% in 2019 to 1.87 billion metric tons, according to data reported by the World Steel Association. The increase stemmed largely from China, whose output rose 8.3% to 996.3 million metric tons (mmt) and represents 53% of global output. India, the world's second-largest producer, increased by 1.8% to 111.2 mmt. The next largest producers, Japan and the United States, produced 99.3 mmt and 87.9 mmt, respectively.



**London, United Kingdom:** Rolls-Royce Holdings plc opened a new facility that will make composite fan blades and fan cases for jet engines. The facility, located in Bristol, United Kingdom, will focus on carbon-fiber composites, which can significantly reduce weight in a jet engine, lowering fuel consumption and emissions. The parts made at this facility will be used in the Rolls-Royce UltraFan engine demonstrator, a new engine design which can reduce fuel burn and CO<sub>2</sub> by at least 25% compared to previous designs. Rolls-Royce adds that the manufacturing hub will use low-energy and emissions processes and feature automated manufacturing methods and materials, aligning with company efforts to achieve zero emissions at its operations and facilities by 2030. (Photo courtesy of Rolls-Royce.)



Mankind made some of its earliest parts by forming metal, and its highest quality parts are usually formed as forgings. Making by deformation is also very environmentally friendly as there can be little to no waste and components are usually quite recyclable. There is also quiet, but remarkable, innovation taking place in this important technical area.

These topics and more will take center stage at the 13th International Conference on the Technology of Plasticity (ICTP 2020). As one of the world’s largest, deepest, and most prestigious manufacturing technology conferences, ICTP 2020 comes to Columbus, Ohio, this July—returning to the United States for only the second time in its history. This iteration of the acclaimed conference

series will continue the tradition of convening the breadth of the metal forming community, from fundamental science to industrial application, to share the latest improvements in all aspects of metal forming science and technology. Over 500 delegates from over 35 countries are expected to participate in this event. Because of its international character and three-year cadence, this event is often called the “Olympics of Metal Forming.”

Here are a few reasons ICTP 2020 will be one of the most enjoyable, important, and mind-expanding meetings you can attend:

- **The physical facilities, setting, and venue are outstanding.** The modern,



Glenn Daehn

*“...ICTP 2020 will be one of the most enjoyable, important, and mind-expanding meetings you can attend.”*

**—Glenn Daehn**



## ICTP 2020: Make Your Plans to Attend Today

July 26–31, 2020

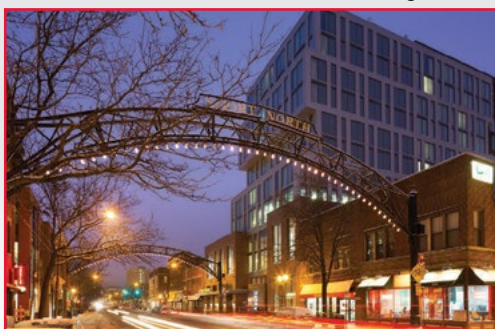
Ohio Union, The Ohio State University, Columbus, Ohio, USA

**Discount Registration Deadline:** June 15, 2020 **Housing Deadline:** June 26, 2020

Excellent housing options are available close to both the venue and cultural and entertainment destinations. For details and the group rate, go to [www.tms.org/ICTP2020](http://www.tms.org/ICTP2020).

Columbus’ Short North Arts District, which includes the character-filled High Street pictured here, includes a variety of galleries, dining, and shopping right at the edge of The Ohio State University campus. The neighborhood is accessible to ICTP 2020 attendees via several transportation options. Visit the Housing & Travel page on [www.tms.org/ICTP2020](http://www.tms.org/ICTP2020) or [shortnorth.org](http://shortnorth.org) for more details about the area.

*Photo credit: Short North Alliance.*



*“Forming structural metals is at the heart of our best and most innovative structures and machines, from implants to aircraft to aesthetic objects like jewelry.”*

—Glenn Daehn

efficient, and relaxed Ohio Union houses the entire meeting in a single venue that is small enough for convenience but large enough to accommodate plenary talks. Further, excellent and affordable hotel space has been reserved along Columbus’ cultural backbone, High Street. Transportation is easy, and excellent food, drink, music, and art abound.

- **Important topics will be addressed by world-leading authorities.** The conference will feature important plenaries from technical and policy leaders, such as *Christopher Schuh*, former chair of Materials Science at Massachusetts Institute of Technology (MIT), and *Matthias Kleiner*, former leader of German Research Foundation (DFG). The broad scope of the plenaries, covering the topics of global issues, simulation, materials, and innovation, will be supported by hundreds of talks on the control, optimization, and innovation of metal forming practice.
- **The conference will pay homage to our great manufacturing heritage.** If metal forming appears to be “mature,” it is only because of the clear, insightful, and systematic work of hundreds of

diligent researchers throughout the world. Special symposia have been developed to honor the character and technical heritage of seven such prominent researchers. Further, special tours will be set to show both the past and future of metal forming and the impact that this has had in Columbus and in the region.

- **There are ample opportunities to interact with industry and technical leaders.** The intimate setting for the conference, relaxed schedule, dinners, award ceremonies, tours, and other events will provide the right environment in which to forge new collaborations.

Forming structural metals is at the heart of our best and most innovative structures and machines from implants to aircraft to aesthetic objects like jewelry. Visit [www.tms.org/ICTP2020](http://www.tms.org/ICTP2020) to register and learn how you can be a vital part of forming the future.

**Glenn Daehn, chair of the ICTP 2020 organizing committee, is a professor in the Department of Materials Science and Engineering at The Ohio State University and is designated the Mars G. Fontana Professor of Metallurgical Engineering.**

## Enhance Your Conference Experience: Add a Tour



Photo credit: National Museum of the United States Air Force.

Conference attendees can add a tour to their meeting registration for enhanced networking opportunities with colleagues. The Ohio State University Technical Tour will be offered on Monday, July 27, and Wednesday, July 29, free of charge. Tour content will be the same on both days. The National Museum of the United States Air Force Tour will be offered on Friday, July 31, and includes round-trip transportation, museum admission, lunch, and one movie ticket at \$55 per person. Guests are welcome to attend all tours. Details can be found at

[www.tms.org/ICTP2020](http://www.tms.org/ICTP2020).





# TMS meeting headlines

View all upcoming meetings online at [www.tms.org/Meetings](http://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 13th International Conference on the Technology of Plasticity (ICTP 2020)**  
July 26–31, 2020  
Columbus, Ohio, USA

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

**TMS 2021 Annual Meeting & Exhibition (TMS2021)**  
March 14–18, 2021  
Orlando, Florida, USA

**12th International Conference on Magnesium Alloys and their Applications (Mg 2021)**  
June 15–18, 2021  
Montreal, Quebec, Canada

Congress on  
**SAFETY**  
in Engineering and Industry **2020**

June 21–24, 2020

Philadelphia Marriott Downtown  
Philadelphia, Pennsylvania, USA  
**Discount Registration Deadline:**  
May 11, 2020

[www.SafetyCongress.org](http://www.SafetyCongress.org)

- The Certified Mine Safety Professional (CMSP) exam and the Process Safety in Engineering and Industry course are options on Sunday, June 21, for professional development.
- Visit the exhibition area Monday morning, June 22, to get an autograph from opening keynote speaker Jim Wetherbee, former NASA astronaut and U.S. Navy captain.
- Dine and network at Tuesday's dinner event featuring keynote speaker Chris Hart, chair of the Washington Metrorail Safety Commission.

The 5th International Congress on

**3DMS**

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](http://www.tms.org/3DMS2020)

- The 5th International Congress on 3D Materials Science (3DMS 2020) will feature three plenary speakers: *Jaafar El-Awady*, Johns Hopkins University, USA; *Satoshi Hata*, Kyushu University, Japan; and *Helena Van Swygenhoven*, Paul Scherrer Institute, Switzerland.
- Interested in contributing to the conversation? Submit an abstract by May 1 for the late-news poster session on the most recent developments and novel preliminary results related to this quickly evolving field.



September 13–17, 2020

Seven Springs Mountain Resort  
Seven Springs, Pennsylvania, USA  
**Discount Registration Deadline:**

August 13, 2020

[www.tms.org/Superalloys2020](http://www.tms.org/Superalloys2020)

- Two courses planned in conjunction with the symposium will cover the topics of Investment Casting of Superalloys and Processing and Manufacture of Ni-based Superalloys Forgings. Course fees apply. Find additional details on the symposium website.
- Learn about new technologies for lifecycle improvement of superalloys. Explore improvements in the processing and performance of existing materials and the development of new alloys.
- Register today and join the community for the longest running symposium dedicated to superalloys.

**MS&T20**

MATERIALS SCIENCE & TECHNOLOGY

October 4–8, 2020

David L. Lawrence  
Convention Center

Pittsburgh, Pennsylvania, USA  
[www.matscitech.org/MST20](http://www.matscitech.org/MST20)

- Network with colleagues and be part of one of the most extensive Materials Science & Technology conference (MS&T) technical programs yet—approximately 100 symposia in 13 technical tracks.
- MS&T offers you an impactful, cross-disciplinary showcase for your work, with programming collaboratively developed by volunteer experts from TMS, the American Ceramic Society (ACerS), and the Association for Iron & Steel Technology (AIST).



# 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](http://www.tms.org/EditorialCalendar).**



## 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 applications in casting, welding, remelting, and additive manufacturing processes that refine grains, homogenize segregation, prevent defect formation, and break up agglomeration of particles. Papers on scientific discoveries, engineering advancement and industrial applications are solicited.

**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. Modeling papers are welcome but 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, time-resolved 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: Machine Learning Applications in Advanced Manufacturing Processes**

**Scope:** This special topic focuses on reducing waste, energy usage and carbon emissions, and spurring innovation in materials development and production. Advances in digital manufacturing, process control, predictive maintenance, and automation can be realized by integration of data analytics and validated models to ensure product quality, optimize operations, enhance productivity, and improve efficiency.

**Editors:** Donna Guillen, Edward Herderick, Judy Schneider, and Srikanth Patala

**Sponsors:** Energy Committee, Additive Manufacturing Committee and Computational Materials

### **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 between individual atoms and 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 on 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 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 their experimental and theoretical results.

**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

**December 2020**

**Manuscript Deadline: July 1, 2020**

### **Topic: Advances in Surface Engineering**

**Scope:** This special topic aims to capture recent advances in processing, characterization, simulation/modeling, and applications related to surface engineering of materials. Areas of interest include surface protection from wear and corrosion, surface characterization techniques, surface alloying, and nanostructured surfaces.

**Editors:** Tushar Borkar, Rajeev Kumar Gupta, Sandip Harimkar, and Arif Mubarak

**Sponsor:** Surface Engineering Committee

### **Topic: Augmenting Physics-based Models in ICME with Machine Learning and Uncertainty Quantification**

**Scope:** This topic will include papers on modeling complex material behavior and failure characteristics at multiple scales, using ICME and physics-based simulation tools augmented by machine learning and uncertainty quantification. Machine learning using datasets from experiments and validated simulation tools can unravel novel material models and physical phenomena. It is necessary to couple these predictions with uncertainty quantification to understand levels of error and ways to mitigate uncertainty.

**Editors:** Somnath Ghosh, David McDowell, and James Saal

**Sponsor:** ICME Committee

### **Topic: Machine Learning and Other Emergent Paradigms in Computational Materials Research**

**Scope:** Computational materials science has been applying essential concepts of machine learning such as guessing and iteratively optimizing solutions, interpolating functions in high-dimensional space, and manipulating patterns in data, since its inception. Recent developments in learning theory and practice, along with the proliferation of data and cheap computing, have resulted in other promising new methods and enhanced embodiments of established techniques. This special topic features papers presented at the Computational Thermodynamics and Kinetics Symposium during the TMS 2020 Annual Meeting & Exhibition.

**Editors:** Jorge A. Muñoz, Sara Kadkhodaei, and James R. Morris

**Sponsor:** Invited

### **Topic: Mesoscale Materials Science**

**Scope:** This topic invites contributions in the area of advanced characterization techniques and computational approaches for understanding the nucleation and evolution of mesoscopic structures in varied class of materials.

**Editors:** Saurabh Puri and Amit Pandey

**Sponsor:** Invited

Congress on

# SAFETY

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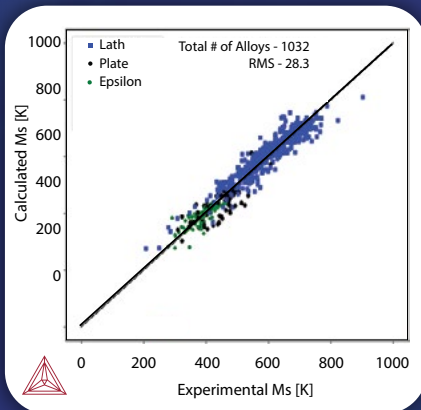
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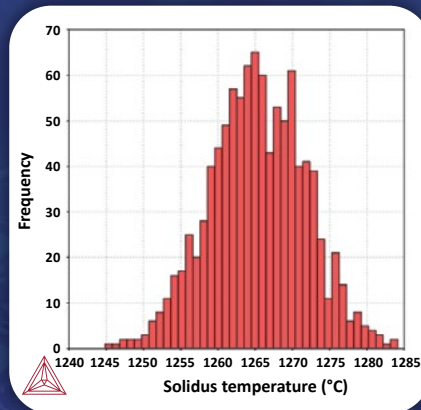
Choose from an extensive selection of thermodynamic and mobility databases in a range of materials, including:

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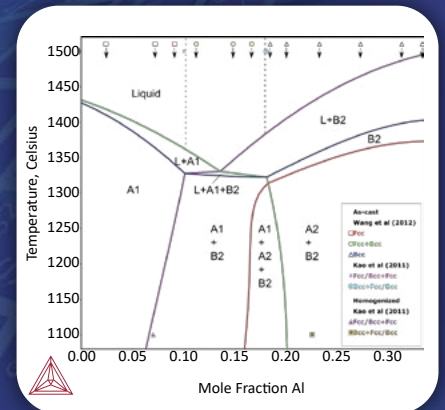
Comparison of calculated and experimental Ms temperatures for a wide range of steels

#### Nickel



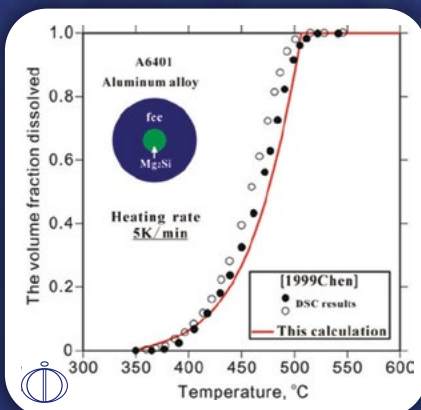
Variation in solidus temperature over 1000 compositions within alloy 718 specification

#### High Entropy Alloys



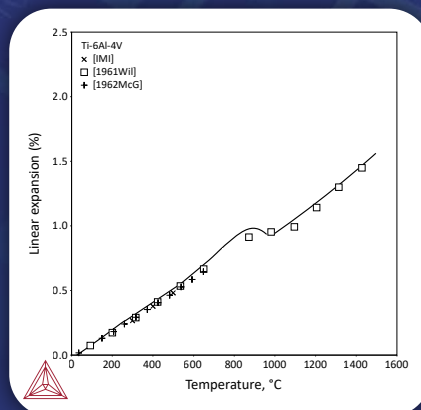
Calculated phase diagram along the composition line of CoCrFeNi-Al

#### Al Alloys



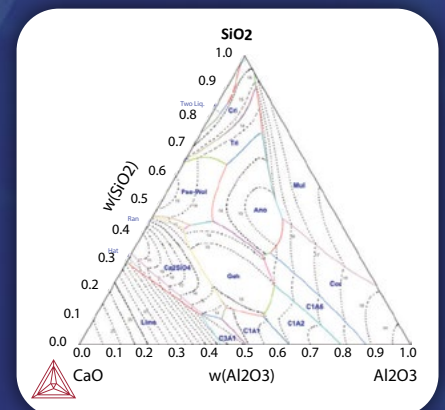
Dissolution of Mg<sub>2</sub>Si precipitate in Alloy A6401

#### Ti and TiAl Alloys



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

#### Oxides



Ternary liquidus projection in oxide systems