

FINAL PROGRAM & EXHIBIT DIRECTORY

Technical Meeting and Exhibition

MST21

MATERIALS SCIENCE & TECHNOLOGY

GREATER COLUMBUS CONVENTION CENTER | COLUMBUS, OHIO, USA

OCTOBER 17 – 21, 2021

WHERE MATERIALS INNOVATION HAPPENS

Featuring:



Annual Meeting



TMS FALL MEETING

MATSCITECH.ORG/MST21

YOUR VALUABLE PARTNER IN MATERIAL SCIENCE

- Alumina
 - Sapphire
 - Quartz
 - Boron Nitride
-
- High Purity Powders
-
- Laser Marking Machine
 - Laser Machining

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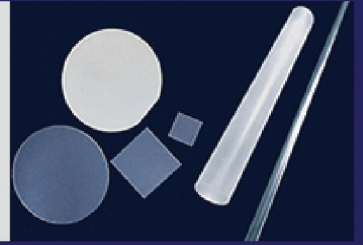


AdValue Technology

Alumina



Sapphire



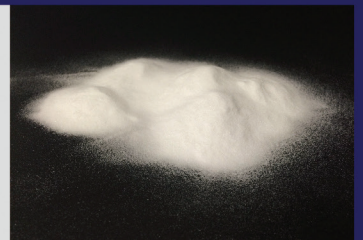
Quartz



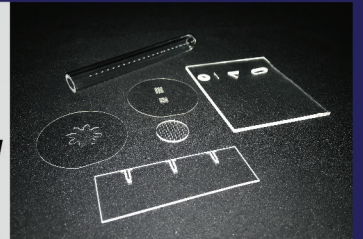
Boron Nitride



High Purity Powders



Laser Machining



Laser Marking Machine



MATSCITECH.ORG/MST21

OCTOBER 17 – 20, 2021

Featuring:

The
American
Ceramic
Society
www.ceramics.org



Annual Meeting



**STEEL PROPERTIES
& APPLICATIONS**

**TMS FALL
MEETING**

GREATER COLUMBUS CONVENTION CENTER | COLUMBUS, OH, USA

WELCOME TO MS&T21!

CONTENTS

Plenary Session	ii
City Map	iv
Convention Center Floor Plans	v
Conference Perks/Policies	vi
Calendar of Events	viii
Lectures	xii
Special Events	xiii
Student Events	xiv
Upcoming Conferences	xv
About the Organizers	xvi
Program at a Glance	1
Exhibit Directory	11

JOIN US FOR MS&T 2022!

➔ **Pittsburgh, Pennsylvania, USA**
October 9-13, 2022

PROGRAM COORDINATING COMMITTEE MEMBERS

2021 Chair and TMS Representative
SARYU FENSIN, Los Alamos National Laboratory

2021 ACerS Representative
TAYLOR D. SPARKS, University of Utah

2021 AIST Representative
DANIEL BAKER, General Motors

COVID-19 UPDATE

MS&T and the Partner Associations (ACerS, AIST, and TMS), working in partnership with the MS&T21 venues, are complying with guidance from the Centers for Disease Control and relevant state and local authorities in an effort to provide a safe and healthy environment for MS&T21 attendees during the ongoing COVID-19 pandemic. However, COVID-19 is an extremely contagious disease and it is not possible to eliminate the risk of spreading or contracting COVID-19. An inherent risk of exposure to COVID-19 exists in any public place where people are present, and efforts to mitigate the risk of exposure to COVID-19 may not be sufficient to prevent spreading or contracting COVID-19. Please visit matscitech.org/MST21 for health and safety updates.

The events, speakers, and services listed here are current as of September 23, but changes may occur due to circumstances beyond our control.

We thank you for your flexibility as we plan the best possible event for you and the materials community.

WHERE MATERIALS INNOVATION HAPPENS

MS&T21

MATERIALS SCIENCE & TECHNOLOGY #MST21

OCTOBER 17 – 20, 2021

PLENARY SESSION

Tuesday, October 19 | 8:00 – 10:40 a.m. | Greater Columbus Convention Center

AIST ADOLF MARTENS MEMORIAL STEEL LECTURE



Anil K. Sachdev

Principal Technical Fellow and Lab Group Manager at GM Global Research and Development

Iron – The Ubiquitous Element

Abstract This talk will reflect briefly upon the discovery of iron and advancements over the centuries that led to its pervasive use in automotive and other demanding structural applications. The martensitic transformation, which became the turning point in steel metallurgy, and its endless ability to create a variety of microstructures with their unique properties, will be described. Finally, the potential for continued development in the iron-based system that exploits the combination of intrinsic unique material attributes with process and product design will be highlighted.

Biography Anil K. Sachdev is currently Principal Technical Fellow and Lab Group Manager at GM Global Research and Development where he started his career in 1977 after receiving his doctorate in Materials Science and Engineering from MIT. His research interests include microstructure design of aluminum and magnesium alloys, metal matrix-composites, and high strength steels for structural applications. The various projects he is leading are focused on improving performance of materials and designs to reduce component mass for improved energy efficiency. Most recently he is leading materials developments related to Additive Manufacturing for high volume automotive applications. He has presented several related keynote talks in International conferences and has been a Key Reader for Metallurgical and Materials Transactions for the past 40 years. He has 100 patents and 100+ external publications related to light metal developments and has received best paper awards and product recognition awards from AFS, TMS, NADCA, IMA for his work.

TMS INSTITUTE OF METALS/ROBERT FRANKLIN MEHL AWARD FOR MS&T21



Tresa Pollock

Alcoa Professor of Materials at the University of California, Santa Barbara

New Superalloys in the Co-Ni Design Space for 3D Printing

Abstract Additive manufacturing promises a major transformation of the production of high economic value metallic materials, enabling innovative, geometrically complex designs with minimal material waste. The overarching challenge is to design alloys that are compatible with the unique additive processing conditions while maintaining material properties sufficient for the challenging environments encountered in energy, space, and nuclear applications. Superalloys with approximately equal parts of Ni and Co offer new design pathways, enabling improved control of solidification and phase transformations that are critical to 3D printing. The role of new experimental, computational, and data-centric design tools in discovering new alloys in this domain will be discussed. The unique properties of Co-Ni alloys will be discussed, along with future challenges for the exploration of the Co-Ni design space.

Biography Tresa Pollock is the Alcoa Professor of Materials at the University of California, Santa Barbara. Her research focuses on the mechanical and environmental performance of materials in extreme environments, unique high temperature materials processing paths, ultrafast laser-material interactions, alloy design, and 3-D materials characterization. More specifically, Pollock's recent projects include the development of new femtosecond laser-aided 3-D tomography techniques and damage detection and modeling by resonant ultrasound spectroscopy. Prior to this work, she was employed at General Electric Aircraft Engines, where she conducted research and development on high temperature alloys for aircraft turbine engines and co-developed the single

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crystal alloy René N6 (now in service). Pollock also served as a professor in the Departments of Materials Science and Engineering at Carnegie Mellon University and the University of Michigan. She has been elected to the U.S. National Academy of Engineering and is a Vennevar Bush Fellow and Fellow of TMS and ASM International. Pollock is currently the editor-in-chief of the *Metallurgical and Materials Transactions* family of journals and was the 2005 TMS President. She earned her B.S. in metallurgical engineering from Purdue University in West Lafayette, Indiana, and her Ph.D. in materials science and engineering from the Massachusetts Institute of Technology in Cambridge, Massachusetts.

ACERS EDWARD ORTON JR. MEMORIAL LECTURE



Clive Randall

Director of Materials Research Institute,
The Pennsylvania State University

*Turning Down the Heat in Sintering to
Enable the Unification of all Materials*

Abstract Typical ceramic sintering temperatures occur at 0.5 to 0.95 of the melting temperatures (T_m), in oxides; we conventionally sinter around 800 to 1800°C. This lecture reviews various chemical pathways, and variables such as pressure, temperature, and time, that enable the cold sintering processes to occur at low temperatures. Using model systems, it is possible to contrast the energetics and mechanisms with conventional sintering processes regarding densification and grain growth kinetics. With the introduction of a cold sintering strategy, a common processing platform ~ 200°C enables the integration of multiple materials that permits new types of composites and devices to be designed. The power of such design versatility will be demonstrated with number of functional ceramics and multilayer devices impacting a broad number of applications. Beyond the successful examples, the many challenges and opportunities of cold sintering will also be discussed, including the vision of a sustainable cyclic economy.

Biography Clive A. Randall is a Distinguished Professor of Materials Science and Engineering and has served as Director of Materials Research Institute at The Pennsylvania State University from 2015. Randall received a B.Sc. in Physics in 1983 from the University of East Anglia and a Ph.D. in Experimental Physics from the University of Essex in 1987, both in his native United Kingdom. He came to Penn State in 1987 as a research associate to work with the Ferroelectrics group, becoming senior research associate in 1992, an associate professor in 1994, and a full professor in 1999. He became director for the National Science Foundation Center for Dielectric Studies (1997-2013) and grew the center to international recognition with a team of excellent colleagues, staff, and students. In 2013, the center was restructured, and he formed the Center for Dielectrics and Piezoelectrics as a co-director until 2016; he still serves as technical advisor. He has authored/co-authored over 500 technical papers and 14 patents, with over 26,000 citations, all in various aspects across the field of electroceramics.

Randall has been awarded several honors, including election to World Academy of Ceramics (2006); he received the IEEE UFFC-S Ferroelectrics Recognition Award (2014). He was made honorary Fellow of the European Ceramic Society and the IEEE Distinguished Lecturer (2019). As an active member of the American Ceramic Society (ACerS), he was honored with the ACerS Fulrath Award (2002) and elected Fellow of ACerS (2005). He and his coauthors received the Spriggs Phase Equilibria Award (2008), and he gave the Friedberg Lecture at ACerS (2011). He received, along with his students, the Edward C. Henry Best Paper of the Year twice from the ACerS Electronics Division (2012 and 2016). His research ranges from material processing, defect and crystal chemistry, and electromechanical properties of electroceramics, with a particular focus on dielectrics and piezoelectrics and their behavior under extreme conditions.

NAVIGATING THE CITY

DOWNTOWN HOTEL MAP

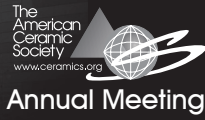
COLUMBUS
LIVE FORWARD

- A. **Hilton Columbus Downtown**
401 N. High St.
- B. **Hyatt Regency Columbus**
350 N. High St.
- C. **Drury Inn & Suites Columbus Convention Center**
88 E. Nationwide Blvd.
- D. **Red Roof PLUS+ Columbus Downtown - Convention Center**
111 E. Nationwide Blvd.



① = Experience Columbus Visitor Center

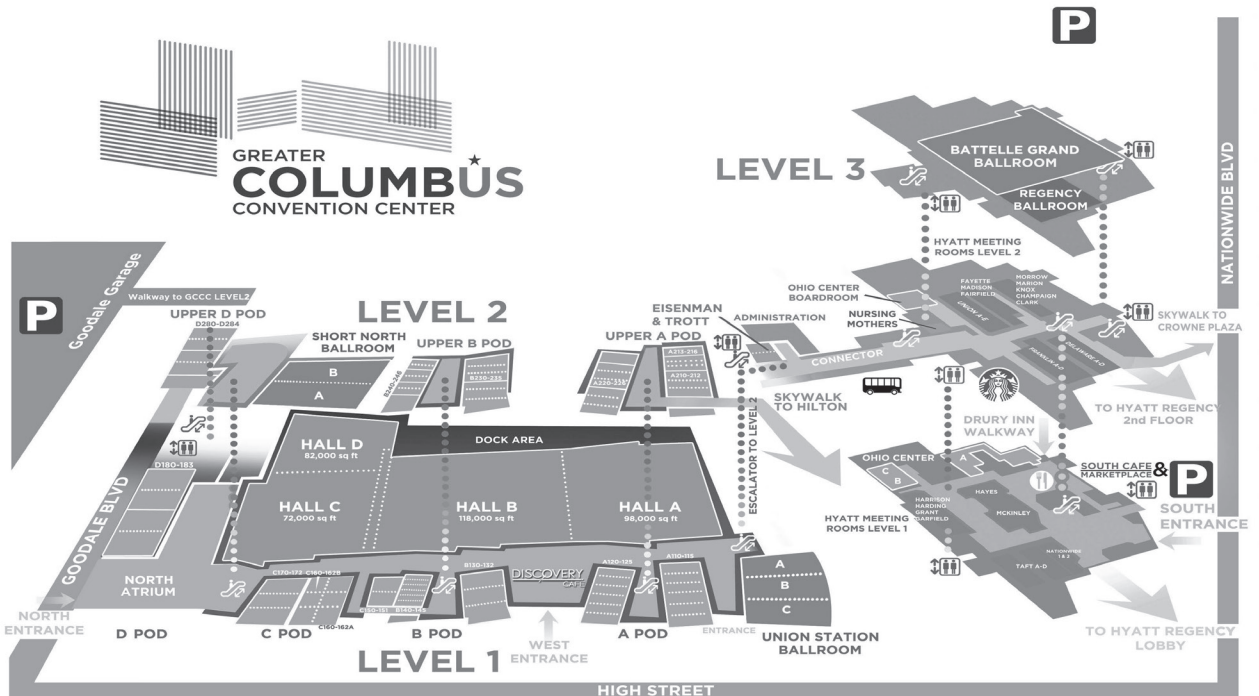
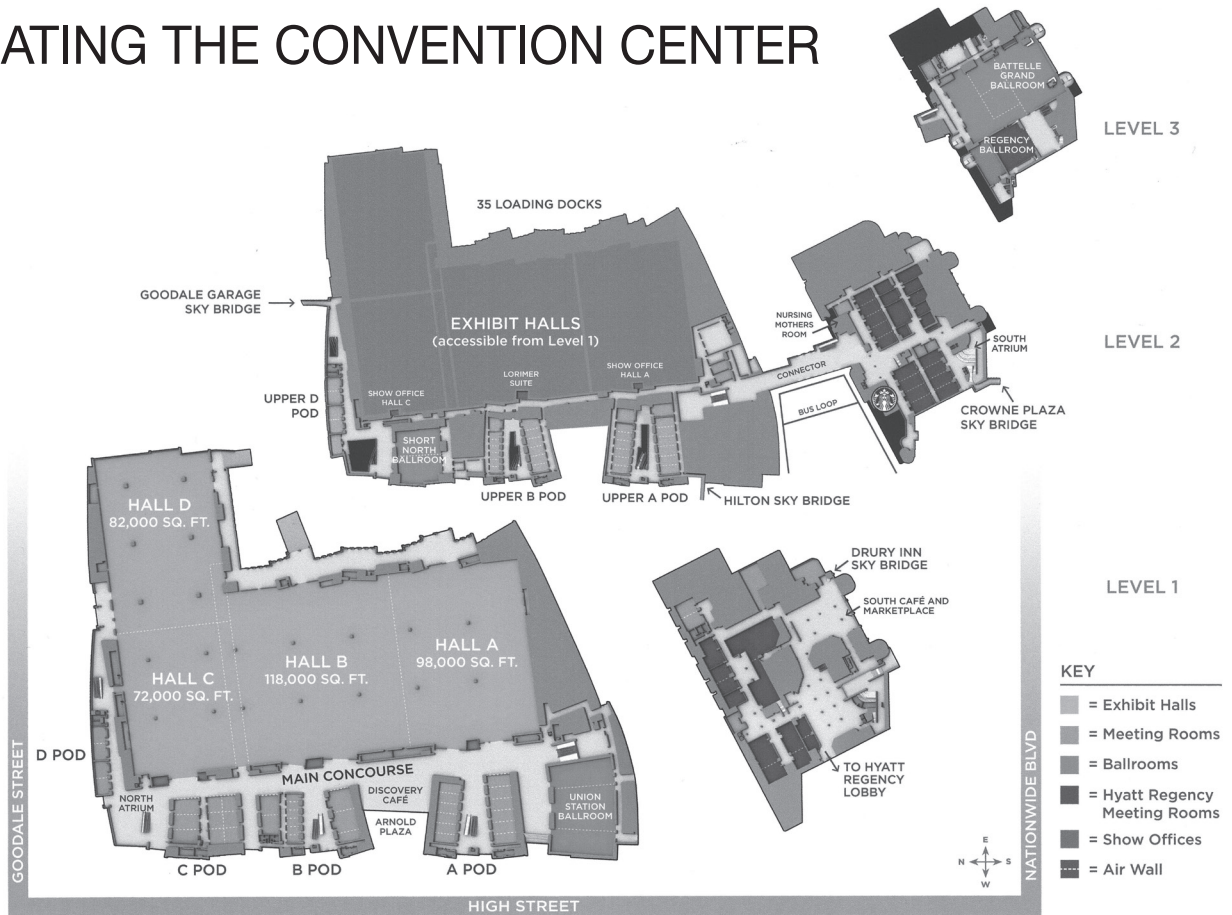
Featuring:



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NAVIGATING THE CONVENTION CENTER





CONFERENCE PERKS/POLICIES

Your MS&T Full Conference Registration Includes:

- MS&T Partners' Welcome Reception (Monday)
- Technical Sessions (Monday – Wednesday)
- Access to MS&T On-Demand presentations (October 22-December 31, 2021)
- Exhibition & Poster Session
- Exhibit hall happy hour reception (Tuesday)
- Tuesday lunch ticket (full conference attendees, students, and exhibitors)
- Wednesday lunch ticket (full conference attendees, students, and exhibitors)
- Exhibition contests and activities
- Complimentary memberships* in ACerS, AIST, TMS, if selected (for non-members only)

*Non-members students receive one free year of Material Advantage membership

Exhibit Dates & Show Hours

Tuesday, October 19	10:00 a.m. – 6:00 p.m.
Wednesday, October 20	9:30 a.m. – 2:00 p.m.

Refreshment Breaks

Refreshment breaks are available in upper A and B pods, as well as lower A and B pods, in the Greater Columbus Convention Center during the morning and afternoon technical session breaks on Monday and Wednesday. On Tuesday, the 7:30 a.m. refreshment break will be located outside the Union Station ballroom. The mid-morning refreshment break on Tuesday will be located inside the exhibit hall.

MS&T + On Demand Access

All MS&T attendees, whether in-person or virtual, have full access to MS&T21 + On-demand through our virtual conference provider, Bravura Technologies. Attendees have access to all virtual prerecorded presentations, as well as the session discussion boards, on the platform, beginning October 22 through December 31, 2021. You can also message other virtual or in-person attendees through the platform's messaging system. You received access to the platform in an email from conference organizers prior to the start of MS&T21. Can't remember your password or have login issues? Contact Bravura support at: support@bravuratechnologies.com

Society Member Lounges—Not Just for Members!

Visit ACerS, AIST and TMS member lounges located in the Greater Columbus Convention Center in the main concourse outside of Exhibit Hall B to:

- Meet members and society staff
- Learn about membership and benefits offered by each society
- Find books, magazines, journals and other technical resources
- Network with colleagues

Internet Access

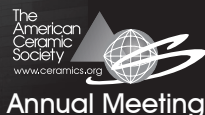
Complimentary WiFi is available in all public spaces of the Greater Columbus Convention Center.

Meeting App

Download the MS&T21 app to serve as your hand-held guide to the meeting. Search for MS&T21 in the App Store and Google Play Store. Once downloaded, log in with the email address you used at registration. App features include:

- Up-to-date program information
- Build your personal conference schedule
- Please note on-demand videos are only available through the browser-based conference platform
- Exhibitor and product details
- Special events and lectures
- Columbus, Ohio information
- Message fellow attendees
- And much more!

Featuring:



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Badge Pick-up and Onsite Conference Registration

The MS&T Conference registration desk will be located in the Greater Columbus Convention Center 1st level concourse.

Registration hours:

Sunday, October 17, 2021	Noon – 5:00 p.m.
Monday, October 18, 2021	7:00 a.m. – 6:00 p.m.
Tuesday, October 19, 2021	7:00 a.m. – 6:00 p.m.
Wednesday, October 20, 2021	7:00 a.m. – 5:00 p.m.

Guests with Special Needs and Family Needs

ACerS, AIST, TMS, the Greater Columbus Convention Center (GCCC), and all the conference hotels strive to accommodate all guests with special needs. The GCCC has a designated nursing mother room located on the Central Atrium. The GCCC also has family restrooms located in Upper A-Pod (behind room A-210) and another in the Center Lounge restrooms near the South Café & Marketplace. These single-use areas are equipped with a seat, electricity and a lockable door.

Please see staff at the MS&T registration desk for assistance with any special needs.

Audio and Visual Recording of Technical Paper Presentations/Sessions

ACerS, AIST, and TMS reserve the right to any still photography, audio, and video reproduction of presentations at every technical session. Recording of sessions (audio, video, still photography) intended for personal use, distribution, publication, or copyright is strictly prohibited without the express written consent of MS&T and the individual authors. MS&T will take photographs and video during the MS&T Conference and Exhibition, and reproduce them in MS&T educational, news or promotional material, whether in print, electronic, or other media, including the MS&T website. By participating in the MS&T Technical Meeting and Exhibition, you grant MS&T the right to use your name, photograph, and biography for such purposes. All postings become the property of MS&T. Postings may be displayed, distributed, or used by MS&T for any purpose.

Cellular Phone Usage

In consideration of attendees and presenters, MS&T21 organizing societies kindly request your cooperation in minimizing disturbances during technical sessions. Please place phones and other electronic devices in silent mode while you are in the meeting rooms.

Be Materials-minded

The MS&T21 organizing societies are committed to being environmentally responsible. Please join us in our efforts by using recycling bins located throughout the convention center.

Start in the Session Room

Presenters and session chairs are asked to report to their session rooms 30 minutes prior to the start of their sessions in order to confirm attendance, to load presentations onto the session room laptop computer, and to network.

Presenters and session chairs for morning sessions should report to their session rooms by 7:30 a.m. and for afternoon sessions by 1:30 p.m.

CALENDAR OF EVENTS

current as of 08-24-21 (subject to change)

Legend:

GCCC=Greater Columbus Convention Center

Hilton=Hilton Columbus (ACerS Headquarters)

Hyatt=Hyatt Regency Columbus (AIST & TMS Headquarters)

Event	Society	Time	Venue Room	
<u>FRIDAY, OCTOBER 15</u>				
Committee and Business Meetings				
ACerS Executive Committee Meeting	ACerS	Noon – 5:00 p.m.	Hilton	Robert King
ACerS President's Council of Student Advisors (PCSA) Business Meeting	ACerS	2:00 p.m. – 6:00 p.m.	Hilton	Private Dining Room
<u>SATURDAY, OCTOBER 16</u>				
Committee and Business Meetings				
ACerS President's Council of Student Advisors (PCSA) Business Meeting	ACerS	8:00 a.m. – 5:00 p.m.	Hilton	Hopkins
ACerS Board of Directors Meeting	ACerS	9:00 a.m. – 5:00 p.m.	Hilton	Elijah Pierce AB
<u>SUNDAY, OCTOBER 17</u>				
Conference Activities				
Registration		Noon – 5:00 p.m.	GCCC	1st Level Concourse
Society Lounges		Noon – 5:00 p.m.	GCCC	1st Level Concourse
Programming Support Desk		2:00 p.m. – 5:00 p.m.	GCCC	1st Level Concourse
Material Advantage Student Functions				
ACerS Keramos National Board and Business Meeting	ACerS	7:00 a.m. – 9:00 a.m.	Hilton	Hilton Restaurant Fireplace Area
ACerS Keramos Student Chapter Business Meeting	ACerS	8:00 a.m. – 9:00 a.m.	Hilton	George Bellows EF
ACerS Keramos Convocation & Business Meeting	ACerS	9:00 a.m. – 11:00 a.m.	Hilton	George Bellows EF
ACerS Keramos Career Speaker	ACerS	11:00 a.m. – Noon	Hilton	George Bellows EF
Undergraduate Student Speaking Contest Semi-Finals		1:00 p.m. – 3:00 p.m.	Hilton	George Bellows AB
Student Networking Mixer		6:00 p.m. – 7:30 p.m.	Hilton	George Bellows Ballroom
Social Functions				
MS&T Wikipedia Edit-A-thon (Invitation Only)		3:00 p.m. – 5:00 p.m.	Hyatt	Franklin A
MS&T Women in Materials Science Reception		5:00 p.m. – 6:00 p.m.	GCCC	North Atrium
TMS Pride Mixer		8:00 p.m. – 10:00 p.m.	Hyatt	Taft AB
Committee and Business Meetings				
ACerS President's Council of Student Advisors (PCSA) Business Meeting	ACerS	8:00 a.m. – Noon	Hilton	Edna Bois Hopkins
ACerS PCSA Mentor Program Tea (Ticketed Event)	ACerS	Noon – 1:00 p.m.	Hilton	George Bellows D
CGIF Board of Trustees Meeting	ACerS	Noon – 5:00 p.m.	Hilton	Elijah Pierce B
TMS Program Committee Meeting (Invitation Only)	TMS	4:00 p.m. – 6:00 p.m.	Hyatt	Morrow
Phase Transformations Committee	TMS	7:30 p.m. – 8:30 p.m.	Hyatt	Knox
ACerS Past Presidents Council Meeting	ACerS	7:00 p.m. – 8:30 p.m.	Hilton	Elijah Pierce B

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Event	Society	Time	Venue Room	
MONDAY, OCTOBER 18				
Conference Activities				
Registration	ACerS	7:00 a.m. – 6:00 p.m.	GCCC	1st Level Concourse
Programming Support Desk		7:00 a.m. – 6:00 p.m.	GCCC	1st Level Concourse
Society Lounges		7:00 a.m. – 6:00 p.m.	GCCC	1st Level Concourse
ACerS Basic Science Division Ceramographic Exhibit and Competition		7:00 a.m. – 6:00 p.m.	GCCC	B Pod Foyer
Technical Sessions		8:00 a.m. – 5:30 p.m.	GCCC	A and B Rooms
MS&T Partners’ Welcome Reception		5:00 p.m. – 6:00 p.m.	GCCC	1st Level Concourse
Exhibition				
Exhibitor Set-Up		8:00 a.m. – 5:00 p.m.	GCCC	Exhibit Hall B
Poster Installation		3:30 p.m. – 5:00 p.m.	GCCC	Exhibit Hall B
Lectures				
The Navrotsky Award for Experimental Thermodynamics of Solids	ACerS	8:00 a.m. – 8:55 a.m.	GCCC	A221
ACerS/EPDC: Arthur L. Friedberg Ceramic Engineering Tutorial and Lecture	ACerS	9:00 a.m. – 10:00 a.m.	GCCC	B130
Material Advantage Student Functions				
AIST Student Plant Tour - watch for details	AIST	1Noon – 4:00 p.m.	GCCC	East Connector Drop-Off
Undergraduate Student Poster Contest Installation	ACerS	3:30 p.m. – 5:00 p.m.	GCCC	Exhibit Hall B
Graduate Student Poster Contest Installation		3:30 p.m. – 5:00 p.m.	GCCC	Exhibit Hall B
Social Functions				
AIST University Industry Relations Roundtable	AIST	10:30 a.m. – 1:00 p.m.	Hyatt	Franklin CD
AIST Board of Trustees Meeting	AIST	2:00 p.m. – 5:00 p.m.	Hyatt	Morrow
AIST Steel to Students Reception	AIST	6:00 p.m. – 8:00 p.m.	Hyatt	Franklin CD
ACerS Annual Honor and Awards Banquet Reception	ACerS	6:30 p.m. – 7:30 p.m.	Hilton	George Bellows Ballroom
ACerS Annual Honor and Awards Banquet	ACerS	7:30 p.m. – 10:00 p.m.	Hilton	Pre-function George Bellows ABCD
Annual Meetings				
ACerS Annual Business Meeting	ACerS	1:00 p.m. – 2:00 p.m.	GCCC	B130
Committee and Business Meetings				
ACerS Basic Science Division General Business Meeting	ACerS	Noon – 1:00 p.m.	GCCC	A123
TMS Pride Meeting	TMS	1:00 p.m. – 2:00 p.m.	Hyatt	Knox
ACerS Education and Professional Development Council (EPDC)	ACerS	2:00 p.m. – 3:00 p.m.	Hilton	Edna Bois Hopkins



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Event	Society	Time	Venue Room	
TUESDAY, OCTOBER 19				
Conference Activities				
Registration		7:00 a.m. – 6:00 p.m.	1st Level Concourse	
Programming Support Desk		7:00 a.m. – 6:00 p.m.	1st Level Concourse	
Society Lounges		7:00 a.m. – 6:00 p.m.	1st Level Concourse	
ACerS Basic Science Division Ceramographic Exhibit & Competition	ACerS	7:00 a.m. – 5:00 p.m.	B Pod Foyer	
Technical Sessions		2:00 p.m. – 4:40 p.m.	GCCC	A and B Rooms
Exhibition				
General Poster Installation		10:00 a.m. – 11:00 a.m.	GCCC	Exhibit Hall B
Exhibition Show Hours		10:00 a.m. – 6:00 p.m.	GCCC	Exhibit Hall B
General Poster Session with Presenters #1		11:00 a.m. – Noon	GCCC	Exhibit Hall B
General Poster Session with Presenters #2		Noon – 1:00 p.m.	GCCC	Exhibit Hall B
MS&T Food Court		Noon – 2:00 p.m.	GCCC	Exhibit Hall B
General Poster Viewing		1:00 p.m. – 4:45 p.m.	GCCC	Exhibit Hall B
Exhibitor Networking Reception		4:00 p.m. – 6:00 p.m.	GCCC	Exhibit Hall B
General Poster Session with Presenters #3		4:45 p.m. – 5:45 p.m.	GCCC	Exhibit Hall B
Lectures				
MS&T21 Plenary Session		8:00 a.m. – 10:40 a.m.	GCCC	Union Station Ballroom
Young Professional Tutorial Luncheon (ticketed)	TMS	Noon – 12:45 p.m.	Hilton	Elijah Pierce A
Young Professional Tutorial Lecture (open)	TMS	12:45 p.m. – 2:00 p.m.	Hilton	Elijah Pierce A
ACerS Frontiers of Science and Society - Rustum Roy Lecture	ACerS	1:00 p.m. – 2:00 p.m.	GCCC	B130
ACerS Alfred R. Cooper Award Session	ACerS	2:00 p.m. – 4:40 p.m.	GCCC	B231
Material Advantage Student Functions				
Undergraduate Student Poster Contest Judging		10:00 a.m. – Noon	GCCC	Exhibit Hall B
Graduate Student Poster Contest Judging		10:00 a.m. – Noon	GCCC	Exhibit Hall B
Undergraduate Student Poster Contest Display		10:00 a.m. – 5:45 p.m.	GCCC	Exhibit Hall B
Graduate Student Poster Contest Display		10:00 a.m. – 5:45 p.m.	GCCC	Exhibit Hall B
Undergraduate Student Poster Contest Display with Presenters		11:00 a.m. – Noon	GCCC	Exhibit Hall B
Graduate Student Poster Contest Display with Presenters		11:00 a.m. – Noon	GCCC	Exhibit Hall B
Mug Drop Contest		11:15 a.m. – 12:15 p.m.	GCCC	Exhibit Hall B
Disc Golf Contest		12:30 p.m. – 1:30 p.m.	GCCC	Exhibit Hall B
Student Awards Ceremony		2:00 p.m. – 3:00 p.m.	GCCC	Exhibit Hall B
Social Functions				
ACerS Diversity and Inclusion Community Reception	AIST	5:30 p.m. – 6:30 p.m.	Hilton	Edna Bois Hopkins
Committee and Business Meetings				
AIST Metallurgy - PPA Technology Committee Meeting	AIST	Noon – 2:00 p.m.	Hyatt	Morrow
TMS Foundation Luncheon (Invitation Luncheon)	TMS	Noon – 2:00 p.m.	Hilton	Room TBD
Titanium Committee Meeting	TMS	5:00 p.m. – 6:00 p.m.	Hyatt	Marion
Shaping & Forming Committee Meeting	TMS	5:00 p.m. – 6:30 p.m.	Hyatt	Madison

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Event	Society	Time	Venue Room
WEDNESDAY, OCTOBER 20			
Conference Activities			
Registration		7:00 a.m. – 5:00 p.m.	GCCC 1st Level Concourse
Programming Support Desk		7:00 a.m. – 6:00 p.m.	GCCC 1st Level Concourse
Society Lounges		7:00 a.m. – 5:00 p.m.	GCCC 1st Level Concourse
ACerS Basic Science Division Ceramographic Exhibit & Competition	ACerS	7:00 a.m. – 5:00 p.m.	GCCC B Pod Foyer
Technical Sessions		8:00 a.m. – 5:20 p.m.	GCCC A and B Rooms
Exhibition			
General Poster Viewing		9:30 a.m. – Noon	GCCC Exhibit Hall B
Exhibition Show Hours		9:30 a.m. – 2:00 p.m.	GCCC Exhibit Hall B
MS&T Food Court		Noon – 2:00 p.m.	GCCC Exhibit Hall B
General Poster Session Removal		Noon – 1:00 p.m.	GCCC Exhibit Hall B
Exhibitor Tear-Down		2:00 p.m. – 9:00 p.m.	GCCC Exhibit Hall B
Lectures			
ACerS Basic Science Division Robert B. Sosman Lecture	ACerS	1:00 p.m. – 2:00 p.m.	GCCC B130
Material Advantage Student Functions			
Undergraduate Student Poster Contest Display		9:30 a.m. – Noon	GCCC Exhibit Hall B
Graduate Student Poster Contest Display		9:30 a.m. – Noon	GCCC Exhibit Hall B
Undergraduate Student Poster Contest Display Dismantle		Noon – 1:00 p.m.	GCCC Exhibit Hall B
Graduate Student Poster Contest Display Dismantle		Noon – 1:00 p.m.	GCCC Exhibit Hall B
Committee and Business Meetings			
ACerS Corporate Partner Breakfast		8:00 a.m. – 9:00 a.m.	Hilton Edna Bois Hopkins
THURSDAY, OCTOBER 21			
Committee and Business Meetings			
TMS Board of Directors Meeting & Retreat (Restricted)		8:00 a.m. – 4:30 p.m.	Hyatt Taft A
FRIDAY, OCTOBER 22			
Committee and Business Meetings			
TMS Board of Directors Retreat (Restricted)		8:00 a.m. – 4:30 p.m.	Hyatt Taft A



LECTURES

(all are located in the convention center)

MONDAY, OCTOBER 18

THE NAVROTSKY AWARD FOR EXPERIMENTAL THERMODYNAMICS OF SOLIDS 8:00 a.m. – 8:55 a.m. | Room A221

- **Xin Qian**, Northwestern University, USA
Advancing Solar-Driven Thermochemical Fuel Production using Nostoichiometric Perovskites

ACERS/EPDC ARTHUR L. FRIEDBERG CERAMIC ENGINEERING TUTORIAL AND LECTURE 9:00 a.m. – 10:00 a.m. | Room B130

- **Elizabeth Opila**, University of Virginia, USA
Environmental Barrier Coatings – Enabling Materials for Extreme Environments

ACERS RICHARD M. FULRATH AWARD SESSION ***Postponed until 2022***

TUESDAY, OCTOBER 19

ACERS FRONTIERS OF SCIENCE AND SOCIETY – RUSTUM ROY LECTURE 1:00 p.m. – 2:00 p.m. | Room B130

- **Alexander Michaelis**, Fraunhofer Institute for Ceramic Technologies & Systems IKTS, Germany
Advanced Ceramics for Energy and Environmental Technology

ACERS GOMD ALFRED R. COOPER AWARD SESSION 2:00 p.m. – 4:40 p.m. | Room B231

- **COOPER DISTINGUISHED LECTURE**
– **Efstathios Kamitsos**, Theoretical and Physical Chemistry Institute, National Hellenic Research Foundation, Greece
Structure and Ion Dynamics in Glass

ACERS GOMD ALFRED R. COOPER YOUNG SCHOLAR AWARD PRESENTATIONS

- **Jacob Lovi**, Iowa State University, USA
- **Graham Beckler**, Coe College USA
- **Lauren Moghimi**, University of Arizona, USA

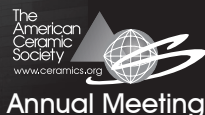
WEDNESDAY, OCTOBER 20

ACERS BASIC SCIENCE DIVISION ROBERT B. SOSMAN LECTURE 1:00 p.m. – 2:00 p.m. | Room B130

- **Wayne Kaplan**, Technion - Israel Institute of Technology, Israel
Combining Atomistic and Continuum Approaches Towards Understanding Interfaces



Featuring:



GREATER COLUMBUS CONVENTION CENTER | COLUMBUS, OH, USA

SPECIAL EVENTS

SUNDAY, OCTOBER 17

Wikipedia Edit-a-Thon for Diversity in Materials Science and Engineering

3:00 p.m. – 5:00 p.m. | Hyatt Regency Hotel, Franklin A

The goal of this collaborative event is to increase the visibility of underrepresented materials scientists and engineers by developing or improving their Wikipedia biography pages. This event is open to all attendees who reserved a spot in advance.

MS&T Women in Materials Science Reception

5:00 p.m. – 6:00 p.m. | North Atrium, First Floor

Enjoy the chance to network with professionals and peers in a relaxed environment.

TMS Pride Networking Mixer

8:00 p.m. – 10:00 p.m. | Hyatt Regency Hotel, Taft AB

Enjoy an evening of informal networking in a safe space to celebrate shared experiences as LGBTQ+ individuals and allies. Cash bar, with light snacks provided. Open to all MS&T21 attendees and organized by TMS Pride of the TMS Diversity, Equity and Inclusion Committee.

MONDAY, OCTOBER 18

ACerS 123rd Annual Membership Meeting

1:00 p.m. – 2:00 p.m. | Room B130

The president reports on Society activities and newly elected officers take their positions during the annual membership meeting. All ACerS members and guests are welcome.

Welcome Reception Hosted by the MS&T Partners

5:00 p.m. – 6:00 p.m. | First Floor Concourse

Grab this opportunity to mingle with members and representatives from all three societies and MS&T partners at this reception in the society lounge area.

AIST Steel to Students

6:00 p.m. – 8:00 p.m. | Hyatt Hotel; Franklin CD

Students with an interest in steel are encouraged to attend this networking event.

ACerS Annual Honor and Awards Banquet

TICKETED EVENT

7:30 p.m. – 10:00 p.m. | Hilton Columbus; George Bellows Ballroom

Enjoy dinner, conversation, and the presentation of Society awards.

TUESDAY, OCTOBER 19

TMS Young Professional Tutorial Luncheon & Lecture

TICKETED EVENT

Noon – 2:00 p.m. | Hilton Hotel, Pierce A

– Elizabeth J. Opila, University of Virginia

All attendees are welcome to attend the lecture portion of this event, but to receive lunch, please purchase a ticket through the registration form.

Input to the National Strategic Plan for Advanced Manufacturing Session

3:00 p.m. – 5:00 p.m. | Room B130

Federal officials are seeking your input in the development of the 2022–2026 National Strategic Plan for Advanced Manufacturing. This round-table event is to solicit information from the conference participants on where advanced manufacturing should go in the future and will follow questions to be issued in a public Request for Information from the White House Office of Science and Technology Policy.

General Poster Session with Presenters #1

11:00 a.m. – Noon | GCCC Exhibit Hall B

General Poster Session with Presenters #2

Noon – 1:00 p.m. | GCCC Exhibit Hall B

General Poster Session with Presenters #3

4:45 p.m. – 5:45 p.m. | GCCC Exhibit Hall B

MONDAY, OCTOBER 18 – WEDNESDAY, OCTOBER 20

ACerS Basic Science Division Ceramographic Exhibit & Competition

Monday, October 18 7:00 a.m. – 6:00 p.m.

Tuesday, October 19 7:00 a.m. – 5:00 p.m.

Wednesday, October 20 7:00 a.m. – 5:00 p.m.



STUDENT EVENTS

Sunday, October 17

2021 Undergraduate Student Speaking Contest

SEMI-FINAL: 1:00 p.m. – 3:00 p.m. | George Bellows AB

MS&T is the host to the Material Advantage Undergraduate Student Speaking Contest. The purpose of the contest is to encourage undergraduate students to present technical papers and to improve their presentation skills. The presentation subject must be technical but can relate to any aspect of materials science and engineering. One contestant from a university is able to compete in this contest.

Student Networking Mixer

6:00 p.m. – 7:30 p.m. | George Bellows AB

Show your school spirit by wearing your colors to this informal and fun event that will provide students with the opportunity to engage with peers, Faculty Advisors, and society volunteer leaders from around the globe. In addition to casual networking, the evening will include cold beverages and light snacks. We hope to see you there!

Monday, October 18

AIST Student Plant Tour

Noon – 4:00 p.m. | GCCC: West Turnaround

AIST will offer students the opportunity to tour Worthington Industries. Advance registration was required. The bus will depart the Convention Center bus entrance at Noon.

Research Lightning Talks

2:00 p.m. – 3:35 p.m. | GCCC: B142/143

The ACerS President's Council of Student Advisors is hosting the Research Lightning Talks symposium to allow presenters to discuss their research in just 5 short minutes! These presentations will focus on broad impacts and main challenges of research and will allow the audience to see the wide impact materials research has on our society. This will be a fun, fast-paced symposium that lends itself well to learning about different types of research at a level that a general audience can understand.

AIST Foundation Steel to Students Recruiting Reception

6:00 p.m. – 8:00 p.m. | Hyatt Regency Columbus: Franklin Room C&D

Position yourself ahead of your peers by attending the Steel to Students Recruiting Reception held in conjunction with MS&T21! The reception is a golden opportunity to meet established professionals and hiring managers interested in investing in the next generation of the steel industry. Take advantage of the opportunity to network and maybe even secure an internship or job after graduation!

Tuesday, October 19

2021 Undergraduate Student Poster Contest

Judging: 10:00 a.m. – 12:00 p.m. | GCCC: Exhibit Hall B

The purpose of this contest is to encourage undergraduate students to present their undergraduate research experiences and to improve their communication skills. The poster entered must be the work of an undergraduate and completed during the undergraduate education of the student.

The work presented in the poster does not have to be performed at the student's home institution, but could be, for example, from a project performed as part of a co-op experience, a summer internship, or a Research Experience for Undergraduates (REU) project.

2021 Graduate Student Poster Contest

Judging: 10:00 a.m. – 12:00 p.m. | GCCC: Exhibit Hall B

The purpose of the contest, open to current graduate students pursuing M.S. or Ph.D. degrees, is to recognize superior research performed during graduate study. Posters must be accepted for the MS&T technical program to be entered into the contest. Entries will be displayed in the general poster session.

Ceramic Mug Drop Contest

11:15 a.m. – 12:15 p.m. | GCCC: Exhibit Hall B

The Ceramic Mug Drop contest allows students to demonstrate their prowess in designing and manufacturing a ceramic mug possessing high strength, mechanical reliability, and/or aesthetics. Mugs fabricated by students from ceramic raw materials are judged (separately) on aesthetics and then by dropping them from ever-increasing heights. The mug with the highest successful drop height will win!

Ceramic Disc Golf Contest

12:30 p.m. – 1:30 p.m. | GCCC: Exhibit Hall B

This contest always attracts attention! Students create discs from ceramic or glass materials to meet certain specifications, and the discs are thrown into a regulation disc golf basket. Each disc will be judged in the categories of farthest distance achieved and artistic merit (aesthetics). The disc that is successfully thrown into the disc golf basket from the farthest distance in the fewest number of shots will be named winner of the Ceramic Disc Golf Contest, and the most aesthetically pleasing/creative disc will be recorded as "Best Looking" disc.

Student Awards Ceremony

2:00 p.m. – 3:00 p.m. | GCCC: Exhibit Hall B

Congratulate the winners of this year's contests: Material Advantage Chapters of Excellence, Student Speaking Contest, Graduate and Undergraduate Poster Contests, Ceramic Mug Drop Contest, Ceramic Disc Golf Contest, TMS Superalloys Awards, AIST/AISI Scholarships, and Keramos National Awards.

Featuring:



GREATER COLUMBUS CONVENTION CENTER | COLUMBUS, OH, USA

UPCOMING CONFERENCES

Event	Date	Location/Sponsor
Virtual European Steel Forum	October 27-29, 2021	Virtual – AIST
82 nd Conference on Glass Problems	November 1-4, 2021	Columbus, Ohio, USA – ACerS
The Making, Shaping & Treating of Steel: 101	November 3-4, 2021	Fort Worth, Texas, USA – AIST
The Congress and National Exhibition of the Steel Industry (CONAC)	November 8-10, 2021	Monterrey, Nuevo Leon, Mexico – AIST
Materials Issues in Nuclear Energy Systems (MiNES) 2021	November 8-12, 2021	Pittsburgh, Pennsylvania, USA – TMS
Environmental Solutions: Water Management	November 9-11, 2021	Corpus Christi, Texas, USA – AIST
TMS Materials Innovation Briefings: Focus on Pittsburgh	November 10, 2021	Cranberry Township, Pennsylvania, USA – TMS
6 th World Congress on Integrated Computational Materials Engineering (ICME 2021)	November 14–18, 2021	Lake Tahoe, Nevada, USA – TMS
2 nd World Congress on High Entropy Alloys (HEA 2021)	December 5–8, 2021	Charlotte, North Carolina, USA – TMS
14 th PACRIM Conference including GOMD 2021 Annual Meeting	December 12-17, 2021	Vancouver, BC, Canada – ACerS
Electronic Materials and Applications 2022	January 19-21, 2022	Orlando, Florida, USA – ACerS
46 th International Conference and Expo on Advanced Ceramics and Composites	January 23-28, 2022	Daytona Beach, Florida, USA – ACerS
Modern Electric Furnace Steelmaking	February 7-11, 2022	Orlando, Florida, USA – AIST
TMS 2022 Annual Meeting & Exhibition	February 27-March 3, 2022	Anaheim, California, USA -- TMS
Digital Transformation Forum for the Steel Industry	March 14-16, 2022	Indianapolis, Indiana, USA – AIST
Energy & Utilities – Roadmap to the Energy Efficient, Sustainable and Decarbonized Steel Industry	March 14-17, 2022	Oak Ridge, Tennessee, USA – AIST
United International Technical Conference on Refractories	March 15-18, 2022	Chicago, Illinois, USA – ACerS
First World Congress on Artificial Intelligence in Materials and Manufacturing (AIM 2022)	April 3–6, 2022	Pittsburgh, Pennsylvania, USA – TMS
National Day of Glass	April 5-7, 2022	Washington D.C., USA - ACerS
SCPD and Southwest Section Meeting in Conjunction with National Brick Research Center Meeting	May 9-11, 2022	Charlotte, North Carolina, USA – ACerS
AISTech 2022 – The Iron & Steel Technology Conference and Exposition	May 16-19, 2022	Pittsburgh, Pennsylvania, USA – AIST
2022 Glass and Optical Materials Division Annual Meeting	May 22-26, 2022	Baltimore, Maryland, USA – ACerS
Advances in Cement-based Materials	June 13-15, 2022	Irvine, California, USA – ACerS
New Developments in Advanced High-Strength Sheet Steels	June 20-23, 2022	Vail, Colorado, USA – AIST
4 th International Ingot Casting Rolling Forging (ICRF) Conference	June 21-23, 2022	Pittsburgh, Pennsylvania, USA – AIST
6 th International Congress on 3D Materials Science (3DMS 2022)	June 26–29, 2022	Washington, D.C., USA – TMS
Pan American Ceramics Congress and Ferroelectrics Meeting of Americas	July 24-28, 2022	Panama City, Panama – ACerS
Additive Manufacturing Benchmarks 2022	August 15–18, 2022	Bethesda, Maryland, USA – TMS
2022 Liquid Metal Processing & Casting Conference (LMPC 2022)	September 18–21, 2022	Philadelphia, Pennsylvania, USA – TMS
MS&T 2022	October 9-13, 2022	Pittsburgh, Pennsylvania, USA – ACerS, AIST & TMS

MS&T21

MATERIALS SCIENCE & TECHNOLOGY

#MST21

ORGANIZED BY THE LEADING MATERIALS SOCIETIES:



The American Ceramic Society is the premier global membership

organization for the technical ceramics and glass community. Celebrate with us Monday evening at the ACerS 123rd Annual Honors and Awards Banquet for the induction of the 2021 Class of Fellows and awards presentations. The Society's prestigious award lectures will be presented at MS&T21:

ACerS/EPDC: Arthur L. Friedberg Ceramic Engineering Tutorial and Lecture, Frontiers of Science and Society – Rustum Roy Lecture, Edward Orton, Jr. Memorial Lecture and Robert B. Sosman Lecture. All attendees are welcome to attend the ACerS lectures. Be sure to stop by the member lounge to relax between the sessions, network with peers, hear what's new with the Society and much more. Visit ceramics.org to learn more about ACerS.



The Association for Iron & Steel Technology (AIST) is a non-profit entity

with over 17,500 members from more than 70 countries. AIST is recognized as a global leader in networking, education and sustainability programs for advancing iron and steel technology. Serving the entire iron and steel community, including steel manufacturers, suppliers, consumers and academics, our mission is to advance the technical development, production, processing and application of iron and steel. Visit www.aist.org to learn more about AIST.



The Minerals, Metals & Materials Society

The Minerals, Metals & Materials Society (TMS) is a member-driven

international professional society dedicated to fostering the exchange of learning and ideas across the entire range of minerals, metals, and materials science and engineering, from minerals processing and primary metals production, to basic research and the advanced applications of materials. Included among its nearly 14,000 professional and student members are metallurgical and materials engineers, scientists, researchers, educators, and administrators from more than 80 countries on six continents. Visit www.tms.org to learn more about TMS.



Technical Meeting and Exhibition

MS&T21

MATERIALS SCIENCE & TECHNOLOGY

In-Person Event: OCTOBER 17-20, 2021 • COLUMBUS, OHIO

On-Demand Content available: OCTOBER 22-DECEMBER 31, 2021

PROGRAM AT A GLANCE

The content in the program at a glance was generated
on September 27, 2021. Please refer to the online
session sheets for the most up-to-date information.



Information as of September 27. Individual talks are listed on session room signs, final technical program, and the MS&T mobile app.

There will be two ways to access this year's technical programming content: at the in-person MS&T conference in Columbus, Ohio, October 17-20, or as on-demand presentations, which can be viewed remotely October 22 through December 31, 2021. You can register for the in-person conference or for on-demand access through the MS&T21 registration page.

Topic Area/Symposium	Date	Time	Room
Program Highlights			
MS&T21 Plenary Session	TUE	AM	USB
MS&T21 Poster Session	TUE	AM & PM	EH B
ACerS Basic Science Division Robert B. Sosman Lecture	WED	PM	B130
ACerS Frontiers of Science and Society - Rustum Roy Lecture	TUE	PM	B130
ACerS GOMD Alfred R. Cooper Award Session	TUE	PM	B231
Acers Navrotsky Award for Experimental Thermodynamics of Solids	MON	AM	A221
ACerS/EPDC: Arthur L. Friedberg Ceramic Engineering Tutorial and Lecture	MON	AM	B130
Additive Manufacturing			
Additive Manufacturing: Advanced Characterization for Industrial Applications			
In-situ and Operando Techniques	MON	AM	A121
Structures and Material Properties	MON	PM	A121
On-Demand Oral Presentations	FRI	AM	OND
Additive Manufacturing: Alloy Design to Develop New Feedstock Materials III			
Modeling and Experiments	MON	AM	A111
On-Demand Oral Presentations	FRI	AM	OND
Additive Manufacturing: Large-Scale Metal Additive Manufacturing			
Advanced Manufacturing Process	WED	AM	A114
Microstructure, Property, and Performance: Characterization and Simulation	WED	PM	A114
On-Demand Oral Presentations	FRI	AM	OND
Additive Manufacturing: Mechanisms and Mitigation of Aqueous Corrosion and High-temperature Oxidation			
Corrosion Assessment of Additively Manufactured Parts I	WED	AM	A112
Corrosion Assessment of Additively Manufactured Parts II	WED	PM	A112
Additive Manufacturing: Processing, Microstructure and Material Properties of Titanium-based Materials			
Session I	MON	AM	A120
Session II	MON	PM	A120
Session III	TUE	PM	A120
Poster Session	TUE	PM	EH B
Session IV	WED	AM	A120
On-Demand Oral Presentations	FRI	AM	OND
Additive Manufacturing of Metals: Equipment, Instrumentation and In-Situ Process Monitoring			
Process Monitoring and Modeling Methods	TUE	PM	A121
Imaging and Sensing Methods	WED	AM	A121
Novel Instrumentation	WED	PM	A121
On-Demand Oral Presentations	FRI	AM	OND
Additive Manufacturing of Metals: ICME Gaps: Material Property and Validation Data to Support Certification			
Data Needs for Simulation: Material Property and Validation Data to Support Certification	MON	AM	A114
Data Acquisition: Material Property and Validation Data to Support Certification	MON	PM	A114
Data Applications: Material Property and Validation Data to Support Certification	TUE	PM	A114
Additive Manufacturing of Metals: Microstructure, Properties and Alloy Development			
Al-based Alloys	MON	AM	A115
Ni-based Alloys	MON	PM	A115
Ti-/Co-/Cr-/Cu-based Alloys	TUE	PM	A115
Other Miscellaneous Materials/Alloys	WED	AM	A115
Fe-based Alloys	WED	PM	A115
Additive Manufacturing: Miscellaneous	WED	PM	A120
On-Demand Oral Presentations	FRI	AM	OND

Program At A Glance

Topic Area/Symposium	Date	Time	Room
Additive Manufacturing Modeling and Simulation: Microstructure, Mechanics, and Process			
AM Modeling - Microstructures & Defects	MON	AM	A113
AM Modeling - Mechanical Properties	MON	PM	A113
AM Modeling - Machine Learning and Artificial Intelligence	TUE	PM	A113
Poster Session	TUE	PM	EH B
AM Modeling - Advanced Materials	WED	AM	A113
AM Modeling - On-Demand Oral Presentations	FRI	AM	OND
AM Modeling - On-Demand Poster Presentations	FRI	AM	OND
Additive Manufacturing of Ceramic-based Materials: Process Development, Materials, Process Optimization and Applications			
Session I: Extrusion-based AM	MON	AM	A112
Session II: Extrusion-based AM and Stereolithography	MON	PM	A112
Session III: Laser Powder Bed Fusion and Novel AM Processes	TUE	PM	A112
Poster Session	TUE	PM	EH B
On-Demand Oral Presentations	FRI	AM	OND
On-Demand Poster Presentations	FRI	AM	OND
Additive Manufacturing of High and Ultra-High Temperature Ceramics and Composites: Processing, Characterization and Testing			
Binder Jet 3D Printing, Post-processing, and Testing	MON	PM	A111
Laser-based Additive Manufacturing, New Methods, and Testing	TUE	PM	A111
Polymer-derived Ceramics (PDCs) and Novel Processing Methods	WED	AM	A111
Extrusion-based Additive Manufacturing Methods	WED	PM	A111
On-Demand Oral Presentations	FRI	AM	OND
Late News Poster Session			
Additive Manufacturing	TUE	PM	EH B
On-Demand Additive Manufacturing Poster Session	FRI	AM	OND
Artificial Intelligence			
Accelerating Materials Science with Big Data and Machine Learning			
Session I	MON	AM	A123
Session II	TUE	PM	A123
Poster Session	TUE	PM	EH B
On-Demand Oral Presentations	FRI	AM	OND
On-Demand Poster Presentations	FRI	AM	OND
AI for Big Data Problems in Advanced Imaging, Materials Modeling and Automated Synthesis			
Accelerating Discovery of Materials	MON	AM	A124
Artificial Intelligence for Automated Synthesis and Characterization	MON	PM	A124
On-Demand Oral Presentations	TUE	PM	OND
Materials Informatics for Images and Multi-dimensional Datasets			
Session I	WED	AM	A124
Session II	WED	PM	A124
On-Demand Oral Presentations	FRI	AM	OND
Late News Poster Session			
Artificial Intelligence	TUE	PM	EH B
Biomaterials			
Next Generation Biomaterials			
Session I	MON	AM	A224
Poster Session	TUE	PM	EH B
Session II	TUE	PM	A224
Session III	WED	AM	A224
On-Demand Oral Presentations	FRI	AM	OND
Porous Materials for Biomedical Applications			
Poster Session	TUE	PM	EH B
Session I	TUE	PM	A222
On-Demand Oral Presentations	FRI	AM	OND

Topic Area/Symposium	Date	Time	Room
Surface Engineering and Characterization of Titanium and Titanium Alloys			
On-Demand Oral Sessions	FRI	AM	OND
Late News Poster Session			
Biomaterials	TUE	PM	EH B
Ceramic and Glass Materials			
Ceramic Matrix Composites			
Session I	MON	AM	B232
Session II	MON	PM	B232
Poster Session	TUE	AM	EH B
On-Demand Oral Presentations	FRI	AM	OND
Ceramics and Glasses Modeling by Simulations and Machine Learning			
Poster Session	TUE	AM	EH B
Session I	WED	AM	B231
Session II	WED	PM	B231
On-Demand Oral Presentations	FRI	AM	OND
On-Demand Poster Presentations	FRI	AM	OND
Engineering Ceramics: Microstructure-Property-Performance Relations and Applications			
Engineering Ceramics	TUE	PM	B233
On-Demand Mechanical Properties of Engineering Ceramics/Applications	FRI	AM	OND
On-Demand Processing-Property Relations	FRI	AM	OND
On-Demand Poster Presentations	FRI	AM	OND
Glasses and Optical Materials: Current Issues and Functional Applications			
Dissolution and Mechanical Properties of Amorphous Solids	MON	AM	B231
Optical Properties and Processing of Amorphous Solids	MON	PM	B231
ACerS GOMD Alfred R. Cooper Award Session	TUE	PM	B231
On-Demand Oral Presentations	FRI	AM	OND
Journal of the American Ceramic Society Awards Symposium			
Journal of the American Ceramic Society Awards Symposium I	WED	AM	B233
Journal of the American Ceramic Society Awards Symposium II	WED	PM	B233
Manufacturing and Processing of Advanced Ceramic Materials			
New Opportunities in Ceramic Processing I	MON	AM	B234
New Opportunities in Ceramic Processing II	MON	PM	B234
Processing of Oxide Ceramics	TUE	PM	B234
Processing of Carbides, Borides, and Nitrides	WED	AM	B234
On-Demand Advanced Manufacturing Process of Ceramics	FRI	AM	OND
Phase Transformations in Ceramics: Science and Applications			
Experimental Studies on Structure and Control I	MON	AM	B230
Experimental Studies on Structure and Control II	MON	AM	B230
Poster Session	TUE	AM	EH B
Computation and Predictions	TUE	PM	B230
On-Demand Oral Presentations	FRI	AM	OND
Pre ceramic Polymers; Synthesis, Processing, Modeling, and Derived Ceramics			
Pre ceramic Polymers and Polymer Derived Ceramics I	WED	AM	B230
Pre ceramic Polymers and Polymer Derived Ceramics II	WED	PM	B230
On-Demand Oral Session: Pre ceramic Polymers	FRI	AM	OND
On-Demand Poster Presentations	FRI	AM	OND
Solid-state Optical Materials and Luminescence Properties			
Session I	WED	AM	B232
Session II	WED	PM	B232
On-Demand Oral Presentations	FRI	PM	OND
Late News Poster Session			
Ceramic and Glass Materials	TUE	AM	EH B

Program At A Glance

Topic Area/Symposium	Date	Time	Room
Electronic and Magnetic Materials			
Advances in Dielectric Materials and Electronic Devices			
Processing/Analysis of Dielectrics & Piezoelectrics	MON	AM	B235
Magnetic Materials	MON	PM	B235
Poster Session	TUE	AM	EH B
Modeling	TUE	PM	B235
On-Demand Poster Presentations	FRI	AM	OND
On-Demand Oral Presentations	FRI	AM	OND
Functional Defects in Electroceramic Materials			
Session I: Defect Engineering in Ceramic Materials	WED	AM	B235
On-Demand Oral Presentations	FRI	AM	OND
Late News Poster Session			
Electronic and Magnetic Materials	TUE	AM	EH B
Energy			
Advanced Characterization of Materials for Nuclear, Radiation, and Extreme Environments			
Fusion Materials and Metals	MON	AM	A215
Nuclear Fuels, Ceramics, and Corrosion	MON	PM	A215
Thermomechanical Testing and In Situ Environments	TUE	PM	A215
Data Intensive and Correlative Methods	WED	AM	A215
On-Demand Oral Presentations	FRI	AM	OND
On-Demand Poster Presentations	FRI	AM	OND
Energy Materials for Sustainable Development			
Energy Harvesting	MON	AM	A216
Solar Energy Conversion	MON	PM	A216
Storage Batteries I	TUE	PM	A216
Fuel Cells/Storage Batteries II	WED	AM	A216
Capacitive, Chemical and Thermal Storage and Conversion	WED	PM	A216
On Demand Energy Harvesting	FRI	AM	OND
On Demand Storage and Conversion	FRI	AM	OND
Hybrid Organic–Inorganic Materials for Alternative Energy			
On-Demand Oral Presentations	FRI	AM	OND
Late News Poster Session			
Energy	TUE	PM	EH B
Fundamentals and Characterization			
Deformation-induced Phase Transformations			
Deformation-induced Phase Transformations	MON	PM	B132
Poster Session	TUE	AM	EH B
On-Demand Oral Presentations	FRI	AM	OND
On-Demand Poster Presentations	FRI	AM	OND
Emergent Materials under Extremes and Decisive In Situ Characterizations			
Materials Characterization at Extreme Conditions	WED	PM	B244/245
On-Demand Oral Presentations	FRI	AM	OND
Grain Boundaries, Interfaces, and Surfaces in Ceramics: Fundamental Structure—Property—Performance Relationships			
Atomistic Approaches	MON	AM	B244/245
Continuum Approaches	MON	PM	B244/245
Poster Session	TUE	AM	EH B
Field Assisted Processes and Mechanics	TUE	PM	B244/245
On-Demand Oral Presentations	FRI	AM	OND
High Entropy Materials: Concentrated Solid Solutions, Intermetallics, Ceramics, Functional Materials and Beyond II			
Materials Discovery and Design I	MON	AM	B131
Materials Discovery and Design II	MON	PM	B131
Processing and Properties I	TUE	PM	B131

Topic Area/Symposium	Date	Time	Room
Processing and Properties II	WED	AM	B131
Theory and Modeling I	WED	AM	B132
Processing and Properties III	WED	PM	B132
Theory and Modeling II	WED	PM	B131
On-Demand Oral Presentations	FRI	AM	OND
Integration between Modeling and Experiments for Crystalline Metals: From Atomistic to Macroscopic Scales III			
Session I	MON	AM	B246
Session II	MON	PM	B246
Poster Session	TUE	PM	EH B
Session III	WED	AM	B246
On-Demand Oral Session I	FRI	AM	OND
On-Demand Oral Session II	FRI	AM	OND
Materials vs Minerals: Bridging the Gap between Materials Science and Earth and Planetary Science			
Session I	WED	AM	B142/143
On-Demand Oral Presentations	FRI	AM	OND
Nucleation of Solid-State Phase Transformations			
Nucleation of Solid-State Phase Transformations	MON	AM	B132
Poster Session	TUE	AM	EH B
On-Demand Oral Presentations	FRI	AM	OND
Probing Defect Properties and Behavior under Mechanical Deformation and Extreme Conditions			
Defect Properties and Behavior in Multicomponent Alloys	MON	AM	B140/141
In Situ and Advanced Characterization of Defects	MON	PM	B140/141
Defect-mediated Mechanical Performance and Damage Tolerance	TUE	PM	B140/141
Radiation Response and Defect Evolution I	WED	AM	B140/141
On-Demand Oral Session: Defect Property, Characterization, and Evolution	FRI	AM	OND
Processing—Microstructure—Property Relationships of Titanium and Titanium Alloys			
Poster Session	TUE	AM	EH B
Session I	WED	AM	B246
Session II	WED	PM	B246
On-Demand Oral Presentations	FRI	AM	OND
Late News Poster Session			
Fundamentals and Characterization	TUE	AM	EH B
Iron and Steel (Ferrous Alloys)			
Advancements in Steel Structural Refinement			
Advancements in Steel Structural Refinement	MON	AM	A211
On-Demand Oral Presentations	FRI	AM	OND
Advances in Ferrous Metallurgy			
Advances in Ironmaking, Steelmaking, and Casting	MON	AM	A210
Advances in Steel Products	MON	PM	A210
Developments in Testing and Processing	TUE	PM	A210
On-Demand Oral Presentations	FRI	AM	OND
Advances in Metallic Coated Advanced Steels			
Liquid Metal Embrittlement and Advances in Coating Production	MON	PM	A211
Poster Session	TUE	PM	EH B
On-Demand Oral Presentations	FRI	AM	OND
Developments in Plate and Line Pipe Steels			
Developments in Plate and Line Pipe Steels	TUE	PM	A211
On-Demand Oral Presentations	FRI	AM	OND
Fracture of Steels: New Approaches to Modeling and Experimental Characterization			
Session I	WED	AM	A211
On-Demand Oral Presentations	FRI	AM	OND

Program At A Glance

Topic Area/Symposium	Date	Time	Room
New Frontiers in Physical Metallurgy of Steels			
New Frontiers in Physical Metallurgy of Steels I	WED	AM	A210
New Frontiers in Physical Metallurgy of Steels II	WED	PM	A210
On-Demand Oral Presentations	FRI	AM	OND
Late News Poster Session			
Iron and Steel (Ferrous Alloys)	TUE	PM	EH B
Materials-Environment Interactions			
Advanced Coatings for Wear and Corrosion Protection			
Session I	MON	AM	A220
Session II	MON	PM	A220
Poster Session	TUE	PM	EH B
On-Demand Oral Presentations	FRI	AM	OND
Advanced Materials for Harsh Environments			
Session I	MON	PM	A223
Poster Session	TUE	PM	EH B
Session II	TUE	PM	A223
Session III	WED	AM	A223
Session IV	WED	PM	A223
Session V	WED	PM	A224
On-Demand Oral Presentations	FRI	PM	OND
Coatings to Protect Materials from Extreme Environments			
Environmental and Thermal Barrier Coatings	MON	AM	A222
Coatings and Surface Treatments for Extreme Environments	MON	PM	A222
On-Demand Coatings for Extreme Environments	FRI	AM	OND
On-Demand Poster Presentations	FRI	AM	OND
Computation Assisted Materials Development for Improved Corrosion Resistance			
Poster Session	TUE	PM	EH B
A: Low Temperature Corrosion	WED	AM	A222
B: High Temperature Corrosion	WED	PM	A222
On-Demand Oral Presentations	FRI	AM	OND
On-Demand Poster Presentations	FRI	AM	OND
Progressive Solutions to Improve Corrosion Resistance for Nuclear Waste Storage			
Corrosion and Aspects of Environmentally Safe Processing of Nuclear Waste Storage Materials	WED	AM	A221
On-Demand Alternative Nuclear Waste Storage Materials and New Imaging Neutron Microscopy Technique for Nuclear Waste Storage Glass Corroded in Aqueous Solution	FRI	AM	OND
Thermodynamics of Materials in Extreme Environments			
Thermodynamics of Nuclear Materials and Minerals	MON	AM	A221
Thermodynamics and Stabilities of Alloys and Ceramics	MON	PM	A221
Poster Session	TUE	PM	EH B
On-Demand: Thermodynamics and Stabilities of Alloys and Ceramics	FRI	AM	OND
On-Demand: Thermodynamics of Nuclear Materials and Minerals	FRI	AM	OND
Modeling			
Multi Scale Modeling of Microstructure Deformation in Material Processing			
Multi Scale Modeling of Microstructure Deformation in Material Processing	MON	AM	A122
On-Demand Oral Session	FRI	AM	OND
Phonon Properties of Materials: Modeling and Experimentation			
Session I	TUE	PM	A122
Session II	WED	PM	A122
On-Demand Oral Presentations	FRI	AM	OND
Late News Poster Session			
Modeling	TUE	PM	EH B

Topic Area/Symposium	Date	Time	Room
Nanomaterials			
Controlled Synthesis, Processing, and Applications of Structural and Functional Nanomaterials			
1D Nanostructures	MON	PM	B240/241
Poster Session	TUE	AM	EH B
Nanocomposites & 2D Materials	TUE	PM	B240/241
Nanoparticles & Nanocomposites I	WED	AM	B240/241
Nanoparticles & Nanocomposites II	WED	PM	B240/241
On-Demand Oral Presentations	FRI	AM	OND
On-Demand Poster Presentations	TUE	AM	OND
Mechanistic Insights into the Synergistic Properties of Nanocomposites			
Mechanistic Insights into the Synergistic Properties of Nanocomposites	TUE	PM	B242/243
On-Demand Oral Presentations	FRI	AM	OND
On-Demand Poster Presentations	FRI	AM	OND
Nanotechnology for Energy, Environment, Electronics, Healthcare and Industry			
Session I	MON	AM	B242/243
Session II	MON	PM	B242/243
On-Demand Oral Presentations	FRI	AM	OND
Late News Poster Session			
Nanomaterials	TUE	AM	EH B
Processing and Product Manufacturing			
13th International Symposium on Green and Sustainable Technologies for Materials Manufacturing and Processing			
Sustainable Manufacturing of Ceramics	MON	AM	A212
Novel Approaches to Sustainable Manufacturing I	MON	PM	A212
Poster Session	TUE	PM	EH B
Novel Approaches to Sustainable Manufacturing II	TUE	PM	A212
On-Demand Novel Approaches to Sustainable Manufacturing	WED	PM	OND
Advances in Surface Engineering			
Poster Session	TUE	PM	EH B
Advances in Surface Engineering	WED	AM	A214
On-Demand Advances in Surface Engineering	FRI	AM	OND
Development of Light Weight Alloys and Composites			
Microstructure and Properties: Composites I	MON	AM	A214
Microstructure and Properties: Composites II	MON	PM	A214
Microstructure and Properties: Composites III	TUE	PM	A214
On-Demand Oral Presentations	FRI	AM	OND
Light Metal Technology			
Magnesium and Joining Technology	MON	AM	A213
Forming Technology	MON	PM	A213
On-Demand Oral Presentations	FRI	AM	OND
Powder Metallurgical Components in High Performance Applications			
Session I	TUE	PM	A213
On-Demand Oral Presentations	FRI	AM	OND
Processing and Performance of Materials Using Microwaves, Electric and Magnetic Fields, Ultrasound, Lasers, and Mechanical Work: The Rustum Roy Symposium			
Session I	MON	AM	B233
Session II	MON	PM	B233
On-Demand Oral Presentations	FRI	AM	OND

Program At A Glance

Topic Area/Symposium	Date	Time	Room
Synthesis, Characterization, Modeling and Applications of Functional Porous Materials			
Poster Session	TUE	PM	EH B
Functional Porous Materials	WED	PM	A212
On-Demand Oral Session: Functional Porous Materials	FRI	AM	OND
Late News Poster Session			
Processing and Product Manufacturing	TUE	PM	EH B
Special Topics			
ACerS Education and Professional Development Symposium			
Introduction to Education and Professional Development Opportunities	MON	AM	B142/143
ACerS Robert B. Sosman Award Symposium: Bridging the Gap between Atomistic and Continuum Approaches to Interface Science			
Sosman I	WED	AM	B130
Sosman II	WED	PM	B130
Curricular Innovations and Continuous Improvement of Academic Programs (and Satisfying ABET along the Way): The Elizabeth Judson Memorial Symposium			
Curricular Innovations and Accreditation	MON	AM	B144/145
Course Innovations	MON	PM	B144/145
On-Demand Oral Presentations	FRI	AM	OND
Input to the National Strategic Plan for Advanced Manufacturing			
Input to the National Strategic Plan for Advanced Manufacturing	TUE	PM	B130
Online Teaching Best Practices for the COVID Era and Beyond			
On-Demand Oral Presentations	FRI	AM	OND
Research Lightning Talks			
Research Lightning Talks I	MON	PM	B142/143

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HOW TO GET THE MOST FROM YOUR VISIT

You probably have your own special system for seeing a show. Whether you look for specific exhibitors first or start by looking for particular products or services, this directory will guide you. You will be able to find exactly what you need quickly and easily.

Alphabetical Listing of Exhibitors	pg 13
Exhibit Floor Plan	pg 14
Alphabetical Listing of Exhibitors with Company Descriptions	pg 17
Products/Services Index	pg 22

SHOW HOURS

Tuesday, October 19, 2021 | 10:00 a.m. – 6:00 p.m.

Refreshment Break	10:30 a.m.
General Poster Session	1:00 p.m. – 6:00 p.m.
Lunch on Show Floor	Noon – 2:00 p.m.
Exhibitor Networking Reception	4:00 p.m. – 6:00 p.m.

Wednesday, October 20, 2021 | 9:30 a.m. – 2:00 p.m.

Lunch on Show Floor	Noon – 2:00 p.m.
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Your conference badge allows you to enter the exhibition during show hours. When visiting exhibits, please present your name badge to the exhibitor's representative to request additional information about products and services.

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A bulletin board for messages will be located in the Registration area.

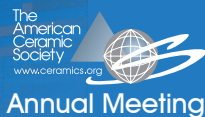
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Because there may have been some late changes in booth assignments, some exhibitors may have a different booth number than was shown on their invitations and advertising. Please check the MS&T21 app or onsite signage for the most-up-to-date listings.

Reasonable precautions have been taken to avoid errors in and omissions from this directory.

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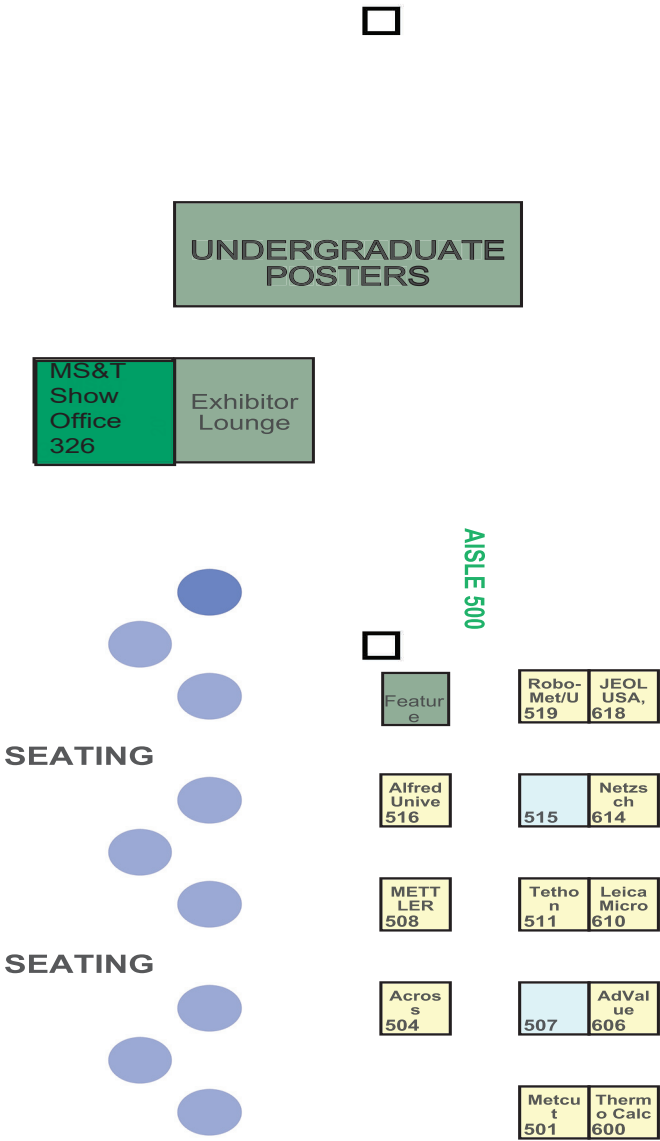
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EXHIBITOR LIST (As of 9/23/21)

COMPANY	BOOTH	COMPANY	BOOTH
Across International	504	Orton Ceramic Foundation	814
AdValue Technology	606	Oxford Instruments America, Inc.	711
Alfred University-NYS College Of Ceramics	516	Photron USA, Inc.	707
Applied Thin Films	909A	Proto Manufacturing	900
Beckman Coulter, Inc	810	TA Instruments	701
Bruker Axs Quantro	822	Tescan USA Inc.	601
Buehler Ltd.	706	Tethon Corporation	511
Cameca	718	Thermcraft, Inc.	905
Carl Zeiss Microscopy, LLC.	700	Thermo Calc Software Inc.	600
Cerablak, LLC	909B	UES	519
EDAX	619	Vision Research	611
Fritsch Milling & Sizing, Inc.	710		
Goodfellow Corporation	906		
HORIBA Scientific	715		
International Centre for Diffraction Data	807		
JEOL USA, Inc.	618		
Keyence Corporation of America	800		
Leco Corporation	723		
Leica Microsystems Inc.	610		
Lithoz America LLC	623		
Metcut Research Inc.	501		
Mettler Toledo, Inc.	508		
MIPAR Software LLC	801		
MS&T Show Office	326		
Netsch Instruments Inc.	614		
NSL Analytical Services, Inc.	722		
Object Research Systems, Inc.	811		

FLOOR PLAN (As of 9/23/21)

- Show Management
- Exhibitor Booths
- Non-Rented Booths

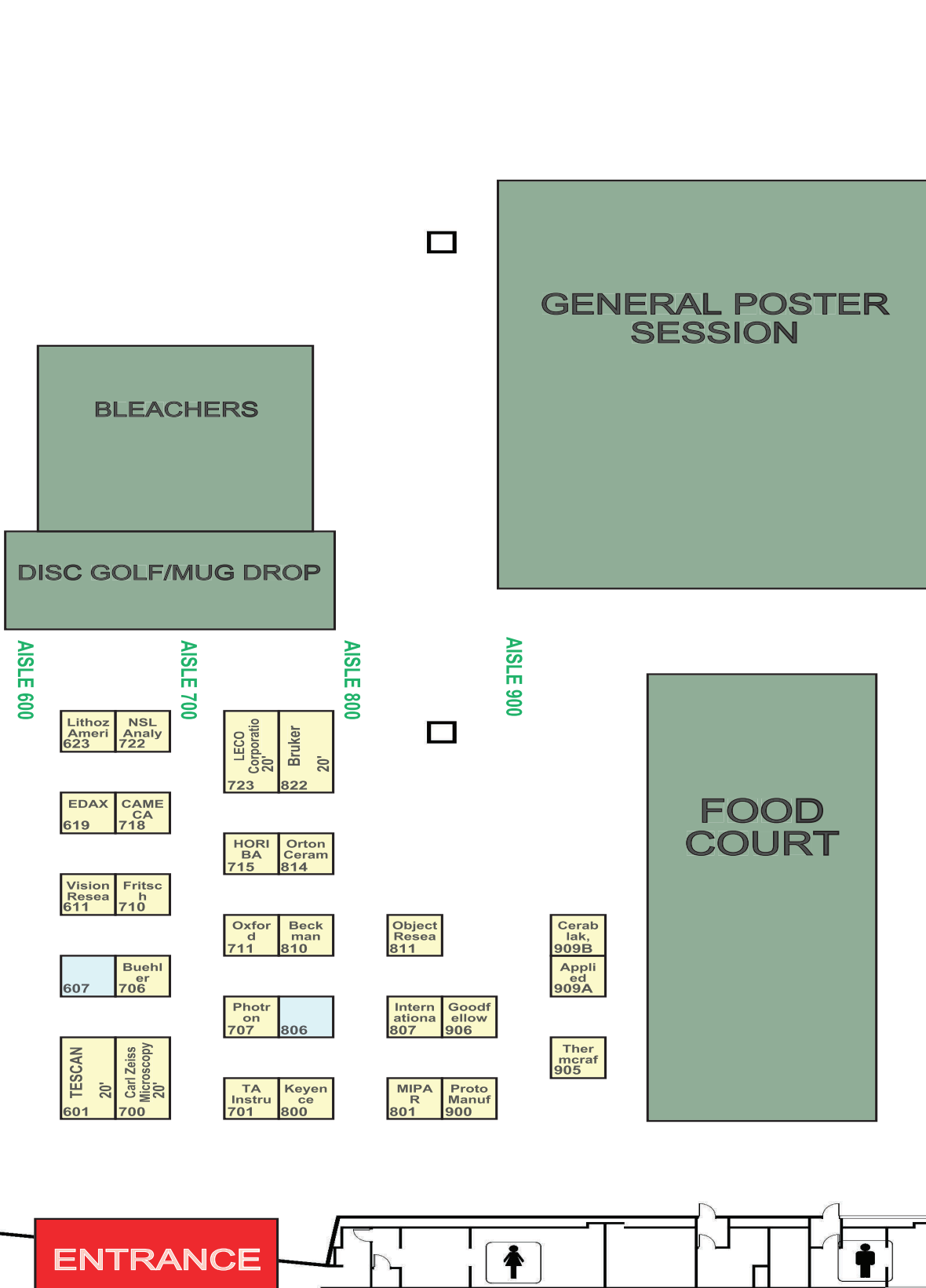


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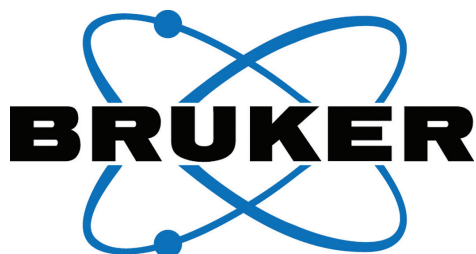


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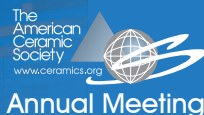
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COMPANY DESCRIPTIONS (As of 9/24/21)

Across International

Booth 504 Across International is an industry leader in the manufacture of heat treatment, laboratory, and material processing equipment. Our company's mission is as simple as it is profound, to empower those advancing science by offering innovative and high-quality equipment, along with the best customer support. As such, we're fully committed to providing uncompromising reliability, innovation, and value to our customers. acrossinternational.com

AdValue Technology

Booth 606 AdValue Technology is a leading supplier of products made of Alumina, Fused Quartz, Sapphire and Boron Nitride. We provide large stock of standard products such as crucibles, tubes & rods, plates & discs, etc. We also offer custom-made components, as well as high purity powders, laser machining service and laser marking machine. advaluetech.com

Alfred University-NYS College Of Ceramics

Booth 516 CACT facilitates collaboration between industry and academia promoting AU's internationally recognized expertise in ceramics and glass materials for energy, environment, health care, defense etc. Alfred University is highly flexible, working with companies of all sizes on a variety of projects, from short-term analytical testing to multi-year sponsored research contracts. alfred.edu/cact

Applied Thin Films

Booth 909A Applied Thin Films, Inc. (ATFI) is a material science company located in Skokie, IL, USA. We develop new and innovative advanced ceramics and ceramic coatings based on first principles of molecular design for high temperature use. ATFI's flagship product, Cerablak is a material platform derived from a specialty metal-organic chemical. After 15 years of dedicated applied R&D (>25 US Patents) and > \$30M investment to secure IP, identify and develop customer-centric product forms, we are now armed with ready-to-market products which have been validated by several Fortune 100 companies. Some of the developed products are being commercialized under Cerablak (Booth # 909B). Visit our booth to learn more about our cutting edge, new and exciting R&D developments for ultra-high temperature use (> 1600°C) and a new generation of spray-on thermal barrier coatings. We will have material samples of various products available for demonstration. Come engage with our passionate engineers and scientists and see how ATFI is paving the way for a cleaner and more energy-efficient future with paradigm-shifting advanced materials! atfinet.com

Bruker Axs Quantron

Booth 822 Bruker's 3D optical profilers, based on Wyko™ technology, provide flexible imaging and measurement capabilities for comprehensive, accurate characterization of surfaces. Our Hysitron Nanomechanical Test Instruments deliver next-generation testing solutions for quantitative nanoscale-to-microscale materials characterization. Combined with SEM, TEM, AFM, and XRM, they support in-situ tests including nanoindentation, compression, bend, and tensile testing. bruker.com

Buehler Ltd.

Booth 706 Buehler, is the manufacturer of the Wilson Hardness testers along with robust metallographic laboratory equipment including the programmable AutoMet and EcoMet grinder polishers along with a complete line of AbrasiMet abrasive and IsoMet precision cutters and the SimpliVac vacuum mounting system and the SimpliMet 4000 mounting press. When quality counts, count on Buehler to deliver metallographic equipment that is reliable and offers repeatable results. Visit buehler.com

Cameca

Booth 718 CAMECA is the world's leader in microanalytical and metrology instrumentation for research and process control. Our instruments measure elemental and isotopic composition down to atomic resolution, and equip government and university labs, as well as high-tech industrial companies around the world. cameca.com

Carl Zeiss Microscopy, LLC.

Booth 700 ZEISS Microscopy is the world's only one-stop manufacturer of light, electron, X-ray and ion microscope systems & offers solutions for correlative microscopy. The portfolio comprises of products and services for life sciences, materials and industrial research, as well as education and clinical practice. With its unique portfolio, constant innovations and strong partnerships, ZEISS Microscopy enables leading researchers to find answers to challenges and drive scientific discovery forward. zeiss.com/microscopy

Cerablak, LLC

Booth 909B Cerablak was spun off from ATFI for broader commercialization of coating products with Cerablak® HTP-100 as our first product launch. Cerablak® HTP-100 is a multi-functional, easy-to-apply high temperature ceramic composite coating with outstanding thermal performance and protection of metals and refractories in harsh high temperature environments. This product has been designed to overcome long-standing issues that have prevented conventional ceramic coatings from achieving broad commercial applicability. Product features of Cerablak® HTP-100 include: No requirement of a bondcoat or separate primer; in-situ primer bonds with excellent adhesion on most metal alloys and ceramics. Sub-micron scale engineered porosity for enhanced toughness and low modulus, such that CTE mismatch issues are not of concern and thermal shock performance is excellent. Coating contains SiC additives that contribute to outstanding hardness and durable high emissivity properties for thermal management at high temperatures. Unprecedented performance against hot corrosion based on an in-situ hermetic quality diffusion barrier formed at coating/substrate interface. atfinet.com

COMPANY DESCRIPTIONS (As of 9/24/21)

EDAX

Booth 619 EDAX is a leading provider of innovative materials characterization systems encompassing Energy Dispersive Spectroscopy (EDS), Wavelength Dispersive Spectrometry (WDS), Electron Backscatter Diffraction (EBSD), and X-ray Fluorescence (XRF). The company designs, manufactures, distributes, and services hardware and software solutions for a broad range of industries, educational institutions, and research organizations. edax.com

Fritsch Milling & Sizing, Inc.

Booth 710 International German manufacturer of lab instruments. Mills, grinders, & analyzers for particle size reduction, sample prep, materials science, product development, & particle analysis for process monitoring & critical applications in QA, QC, R&D. Particle size from nano up. Core competence is innovative development & production of premium instruments. Familiar w/challenges & offer constructive solutions across industries. Offers highest dependability, innovative technology, & simplest operation. fritsch-international.com

Goodfellow Corporation

Booth 906 Goodfellow is a leading supplier of metals, polymers, ceramics and other materials to meet the needs of science and industry worldwide. The company specializes in supplying small quantities (a few grams to a few kilos) of metals and materials for research, prototype development and specialized manufacturing applications. Standard products can be found online at the comprehensive Goodfellow Catalog. Custom products and materials in larger quantities may be available upon request. goodfellowusa.com

HORIBA Scientific

Booth 715 HORIBA provides unique products for materials characterization for a wide range of applications including additive manufacturing, ceramics, glass, ferrous and non-ferrous alloys, coated steels and more. These include Carbon/Sulfur, Oxygen/Nitrogen and Hydrogen analysis on solids samples from the ppm to several percent. We also have GD-OES Spectrometers for bulk & surface analysis and ICP-OES spectrometers that measure the concentration of elements from ppb to several percent. horiba.com/scientific



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The American Ceramic Society
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COMPANY DESCRIPTIONS (As of 9/24/21)

International Centre for Diffraction Data

Booth 807 The International Centre for Diffraction Data (ICDD®) and Materials Data® (MDI™) focus on the materials characterization needs of the scientific community by providing the Powder Diffraction File™ (PDF®) and JADE® analytical software. PDF Release 2022 has over 1,000,000 entries for phase ID. JADE provides the best in X-ray powder diffraction data analysis for Phase Identification, WPF and Rietveld refinement. JADE and the PDF are a powerful combination for all of your materials analyses needs. icdd.com

JEOL USA, Inc.

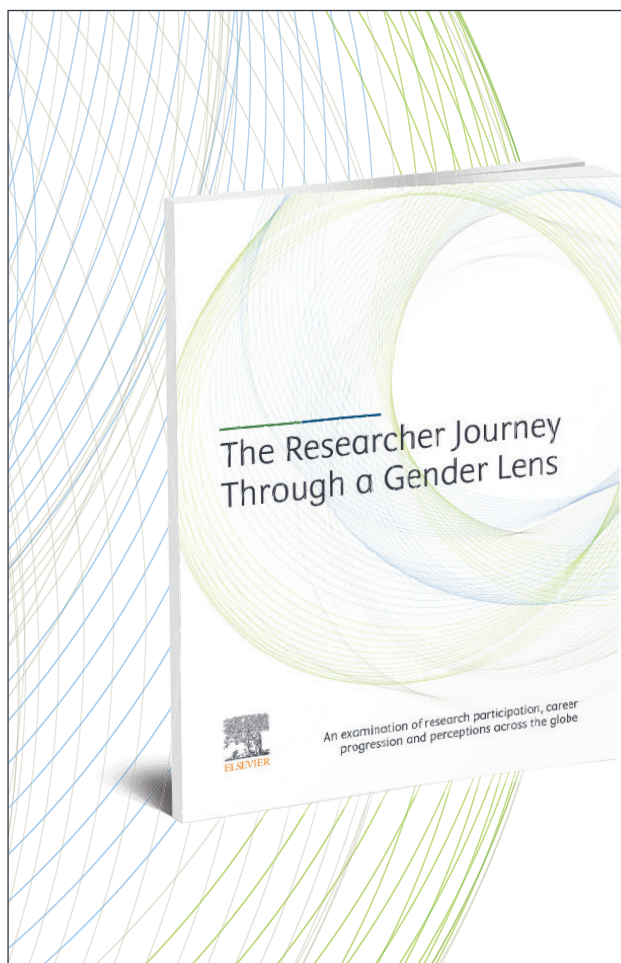
Booth 618 The world's leading supplier of electron microscopes. Scanning Electron Microscopes range from the benchtop SEMs, large chamber SEMs to ultrahigh res. analytical field emission SEMs. Adv. automation, live EDS analysis & particle analysis software streamline SEM workflow. Our Transmission Electron Microscopes are known for advanced research in materials science. Our products range from multipurpose LaB6 TEM to high throughput S/TEM with Cold FEG to atomic resolution next-gen Cs corrected TEM. jeolusa.com

Keyence Corporation of America

Booth 800 With quality standards increasing, KEYENCE's advanced microscope & surface measurement systems ensure that our customers are able to meet those standards. High resolution imaging, ISO-certified roughness, & 2D/3D measurement is coupled with easy-to-use interfaces for an elevated inspection experience. KEYENCE offers a full range of services: on-site demonstrations & sample testing, training, tech support, & overnight shipping so our customers can improve their processes as quickly as possible. keyence.com/products/microscope

Leco Corporation

Booth 723 LECO has been providing technologically advanced products and solutions for inorganic, organic, and metallographic analysis for 85 years, including determinators for carbon, sulfur, hydrogen, nitrogen, and oxygen, and glow discharge spectrometers. Our metallographic product line features a variety of sectioning machines, grinders/polishers, mounting equipment and supplies, microscopes, and hardness testers. LECO.com



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COMPANY DESCRIPTIONS (As of As of 9/24/21)

Leica Microsystems Inc.

Booth 610 Leica Microsystems develops and manufactures microscopes and scientific instruments for the analysis of microstructures and nanostructures. Widely recognized for optical precision and innovative technology, the company is one of the market leaders in compound and stereo microscopy, digital microscopy, confocal laser scanning and super-resolution microscopy. leica-microsystems.com

Lithoz America LLC

Booth 623 Lithoz is the world leader in additive manufacturing for advanced ceramics. Lithoz CeraFab 3D printers use lithography-based ceramics manufacturing to deliver the quality, reliability, and repeatability needed for serial production of precise ceramic parts. CeraFab printers allow you to in-source ceramic development & production, in a wide variety of technical & functional ceramics, for structural parts, insulators, combustion lattices, catalyst supports, and casting-cores. lithoz.com/en

Metcut Research Inc.

Booth 501 Since 1948, Metcut Research Inc. has provided worldwide materials evaluation services to the aerospace, power generation, oil & gas, ground transportation, and bio-materials industries. Services include test specimen manufacturing, mechanical and physical properties testing, structural behavior evaluation, materials analysis, and failure investigations. Our independent employee-owned corporation has locations in Cincinnati, OH (Metcut and CTL) and Nantes, France (Metcut Recherches S.A.S). metcut.com

Mettler Toledo, Inc.

Booth 508 METTLER TOLEDO thermal analysis Excellence instruments allow you to characterize sample materials over a very wide temperature range. Control all the instruments from a single, powerful, easy-to-use software platform. Each instrument configuration has the highest level of performance so you can have complete confidence in your results. mt.com/us/en/home.html

MIPAR Software LLC

Booth 801 MIPAR Image Analysis is a world-leading AI algorithm development and image analysis software company. They specialize in efficiently, accurately, and reliably extracting measurements from complex images. From grain analysis, to phase fraction, to particle sizing our extensive portfolio can assist in automating solutions to a variety of real-world applications. mipar.us

MS&T Show Office

Booth 326 MS&T is comprised of three associations: ACerS, AIST, and TMS.

Netzsch Instruments Inc.

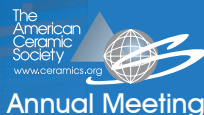
Booth 614 NETZSCH Instruments North America is the leader in thermal analysis and thermophysical properties measurement, as well as offering commercial testing services in our laboratories. Netzsch Instruments and experts serve the needs of all materials research and applied markets including metals and alloys, energy, coatings, polymers, the chemical industry, building materials, pharmaceuticals, food, cosmetics, environmental analysis and much more. The best companies rely on NETZSCH Instruments. netzsch-thermal-analysis.com/us/

NSL Analytical Services, Inc.

Booth 722 NSL supports innovation by testing powder metal feed stock, proto type designs and final product in the Additive Manufacturing Industry. We specializing in testing advanced materials, failure analysis and chemical testing for multiple verticals including the aerospace, nuclear and healthcare industries. Testing capabilities includes: Chemical Composition; Powder Characterization (Flow rate, Particle size and distribution) and Metallurgical Analysis (Mechanical testing, Grain structure). nslanalytical.com/



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COMPANY DESCRIPTIONS (As of 9/24/21)

Object Research Systems, Inc.

Booth 811 Object Research Systems develops deep learning powered 3D visualization and image analysis software. Dragonfly, ORS' flagship product, provides innovators from leading universities and industries, an advanced machine learning and neural networks-based segmentation engine. Dragonfly's quantification tools provide powerful options for counting, measuring, and characterizing image features, such as pores, fibers, grains, and more. theobjects.com

Orton Ceramic Foundation

Booth 814 Orton Ceramic Foundation provides Thermal Analysis Instruments and Contract Testing as well as the products for verification of Thermal Processing (TempCHEKs, TempTABs, and pyrometric cones). This year Orton introduces Hot Disk TPS Instrument as a quick and easy way to determine thermal conductivity and thermal diffusivity (and, as a result, heat capacity) from a single measurement. Hot Disk allows a minimal sample prep, a broad range of temperatures, and a variety of materials to be tested (solids, powders, liquids, thin films). Orton's line of instruments also includes dilatometers, gradient furnaces, thermal conductivity and glass viscosity instruments. Orton offers more than 70 tests to measure the physical, thermal, and mechanical properties. ortonceramic.com

Oxford Instruments America, Inc.

Booth 711 Oxford Instruments NanoAnalysis provides leading-edge tools that enable materials characterisation and sample manipulation at the nanometre scale. Used on electron microscopes (SEM and TEM) and ion-beam systems (FIB), our tools are used for R&D across a wide range of academic and industrial applications including semiconductors, renewable energy, mining, metallurgy, and forensic. nano.oxinst.com

Photron USA, Inc.

Booth 707 Photron cameras are ideal for the very challenging high-speed applications found in the automotive, military/defense, aerospace, medical, scientific, R&D and manufacturing industries. With offices in Asia, North America and Europe and knowledgeable distributors on six continents, Photron offers superior customer service and technical support on a worldwide basis. photron.com

TA Instruments

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Tescan USA Inc.

Booth 601 TESCAN is focused on research, development, and manufacturing of Scanning Electron Microscopes, Focused ion beam systems, X-Ray CT systems, and supplementary accessories for SEMs, image processing, custom systems, and software development. tescan.com

Tethon Corporation

Booth 511 With over 1,200 customers in 40 countries Tethon 3D is the leading provider of ceramic materials for additive manufacturing. Tethon 3D produces a wide variety of ceramics for UV 3D printing technologies and Binder Jetting. Tethon has also launched the first Desktop DLP printer designed for ceramics and metals. The open and fully adjustable printer is used by researchers across the world who are developing their own ceramic and metal slurries. tethon3d.com/

Thermcraft, Inc.

Booth 905 Thermcraft Inc. Booth 905 Thermcraft is international leading manufacturer of industrial and laboratory furnaces, ovens, heating elements, insulation packages and thermal processing accessories. At Thermcraft, customer service is our #1 Priority! thermcraftinc.com

Thermo Calc Software Inc.

Booth 600 Thermo-Calc empowers metallurgists, researchers and process engineers to: Calculate thermodynamic and phase-based properties as a function of chemistry, temperature, and time. Fill in data gaps while reducing costly, time-consuming experiments. Predict how actual vs nominal chemistries affect processing windows. Accelerate materials development while reducing risk. Troubleshoot issues during materials processing. Databases for Steels, Al-, Ti-, Mg-, Cu-, HEAs, Ni-superalloys, oxides and more. thermocalc.com

UES

Booth 519 Solve your Scientific Challenges! Leveraging our unique and fully-automated Robo-Met.3D® materials characterization system, we deliver the materials insights you need for your materials science applications, from validating additive manufacturing builds or non-destructive testing methods, to testing metals and composite materials, to analyzing bearings and welds or coatings for quality control, and more. ues.com/

Vision Research

Booth 611 Phantom high-speed cameras are known for unparalleled light sensitivity, image resolution, acquisition speed, and image quality – necessities for analyzing high-speed events. Standard cameras with on-board memory from the VEO series to the TMX series are perfect for research and development applications. Phantom Machine Vision cameras are for applications that require real time processing or long-record times. "When it's too fast to see, and too important not to." phantomhighspeed.com

PRODUCTS AND SERVICES INDEX

	Booth#		Booth#
ADDITIVE MANUFACTURING		HEAT TREATING EQUIPMENT & SERVICES	
<i>3D Printing and Rapid Prototyping Equipment</i>		<i>Heat Treating Equipment</i>	
Lithoz America LLS	623	Across International	504
CERAMIC PROCESSING EQUIPMENT		Orton Ceramic Foundation	814
<i>Fiber Insulation</i>		Thermcraft Inc.	905
Thermcraft Inc.	905	MATERIALS TESTING/CHARACTERIZATION EQUIPMENT & SUPPLIES	
<i>Furnaces</i>		<i>Corrosion Testing</i>	
Thermcraft Inc.	905	Bruker	822
<i>Glass</i>		METTLER TOLEDO	508
Applied Thin Films Inc.	909A	<i>Creep Testers</i>	
Goodfellow Corporation	906	METTLER TOLEDO	508
<i>Kilns</i>		<i>Failure Analysis</i>	
Across International	504	Bruker	822
Orton Ceramic Foundation	814	JEOL USA, Inc.	618
Thermcraft Inc.	905	LECO Corporation	723
<i>Mixers/Mills/Grinders</i>		METTLER TOLEDO	508
Across International	504	NSL Analytical Services	722
Fritsch Milling & Sizing, Inc.	710	Photron USA, Inc.	707
<i>Refractory Ceramics</i>		Vision Research	611
Applied Thin Films Inc.	909A	<i>Fatigue Testers</i>	
Goodfellow Corporation	906	Bruker	822
Thermcraft Inc.	905	METTLER TOLEDO	508
<i>Single Crystals</i>		Photron USA, Inc.	707
Goodfellow Corporation	906	<i>Fractures Toughness Testing Equipment</i>	
COMMERCIAL MATERIALS TESTING/CHARACTERIZATION SERVICES		METTLER TOLEDO	508
<i>Commercial Materials Testing</i>		Photron USA, Inc.	707
Metcut Research Inc.	501	Vision Research	611
METTLER TOLEDO	508	<i>Glass Testing</i>	
MIPAR Software LLC	801	METTLER TOLEDO	508
NSL Analytical Services	722	Orton Ceramic Foundation	814
Orton Ceramic Foundation	814	Photron USA, Inc.	707
UES Inc.	519	<i>Hardness Testing Equipment</i>	
ENGINEERING APPLICATIONS AND RELATED INTERESTS		Bruker	822
<i>Equipment Design</i>		LECO Corporation	723
JEOL USA, Inc.	618	METTLER TOLEDO	508
Thermcraft Inc.	905	Photron USA, Inc.	707
<i>Equipment Manufacturing (OEM)</i>		<i>Image Analyzers</i>	
Carl Zeiss Microscopy, LLC	700	Carl Zeiss Microscopy, LLC	700
JEOL USA, Inc.	618	Fritsch Milling & Sizing, Inc.	710
Orton Ceramic Foundation	814	JEOL USA, Inc.	618
Thermcraft Inc.	905	LECO Corporation	723
<i>Modeling Processes</i>		MIPAR Software LLC	801
JEOL USA, Inc.	618	Photron USA, Inc.	707
METTLER TOLEDO	508	<i>Impact Testers</i>	
Thermo Calc Software Inc.	600	NSL Analytical Services	722
		Photron USA, Inc.	707
		Vision Research	611

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PRODUCTS AND SERVICES INDEX

	Booth#		Booth#
Materials Selection			
Bruker	822	Tensile Testers	
JEOL USA, Inc.	618	METTLER TOLEDO	508
METTLER TOLEDO	508	NSL Analytical Services	722
NSL Analytical Services	722	Photron USA, Inc.	707
		Vision Research	611
Mechanical Testing (including hardness)			
Bruker	822	Test / Lab Furnaces / Environmental Chambers	
METTLER TOLEDO	508	Across International	504
NSL Analytical Services	722	Orton Ceramic Foundation	814
Photron USA, Inc.	707	Thermcraft Inc.	905
Metallographic Specimen Preparation Equipment / Supplies			
LECO Corporation	723	Thermal Analysis	
UES Inc.	519	JEOL USA, Inc.	618
Metallographs			
LECO Corporation	723	METTLER TOLEDO	508
UES Inc.	519	NSL Analytical Services	722
Microelectronic Failure Analysis			
Bruker	822	Orton Ceramic Foundation	814
JEOL USA, Inc.	618	TA Instruments	701
KEYENCE Corp.	800	Tribology	
Microscopes			
Across International	504	Bruker	822
Bruker	822	Ultrasonic Testing Equipment	
Carl Zeiss Microscopy, LLC	700	Across International	504
JEOL USA, Inc.	618	Universal (Tension / Compression) Testing Machines	
KEYENCE Corp.	800	Bruker	822
LECO Corporation	723	METALS & ALLOYS - FERROUS METALS	
Leica Microsystems	610	Stainless Steels	
NSL Analytical Services	722	Goodfellow Corporation	906
TESCAN	601	Thermo Calc Software Inc.	600
Optical and/or Electron Microscopy (SEM, TEM, etc.)			
Bruker	822	Steels, Carbon and Alloy	
EDAX, Inc.	619	Thermo Calc Software Inc.	600
JEOL USA, Inc.	618	NONFERROUS METALS	
KEYENCE Corp.	800	Aluminum and Aluminum Alloys	
NSL Analytical Services	722	Thermo Calc Software Inc.	600
Photron USA, Inc.	707	Copper Alloys	
TESCAN	601	Thermo Calc Software Inc.	600
UES Inc.	519	Magnesium Alloys	
Particle Size Analysis			
Bruker	822	Thermo Calc Software Inc.	600
Fritsch Milling & Sizing, Inc.	710	Nickel-, Nickel-Iron-, and Cobalt-Base High Performance Alloys	
JEOL USA, Inc.	618	Thermo Calc Software Inc.	600
KEYENCE Corp.	800	Other Non-ferrous Metals	
MIPAR Software LLC	801	Goodfellow Corporation	906
Quality Control			
Bruker	822	Refractory Metals	
Fritsch Milling & Sizing, Inc.	710	Goodfellow Corporation	906
JEOL USA, Inc.	618	Superalloys	
KEYENCE Corp.	800	Goodfellow Corporation	906
METTLER TOLEDO	508	Titanium Alloys	
Orton Ceramic Foundation	814	Thermo Calc Software Inc.	600
Residual Stress Analyzers / Testers			
METTLER TOLEDO	508		
Proto Manufacturing	900		
Vision Research	611		

PRODUCTS AND SERVICES INDEX

	Booth#		Booth#
OTHER MATERIALS			
<i>Consulting Services</i>			
UES Inc.	519	<i>Heat Treating</i>	
<i>Contract R & D Services</i>			
Applied Thin Films Inc.	909A	Across International	504
UES Inc.	519	Thermcraft Inc.	905
<i>Electronic Materials</i>			
Applied Thin Films Inc.	909A	<i>Machining/Grinding</i>	
<i>Glass</i>			
Applied Thin Films Inc.	909A	Across International	504
<i>Nanomaterials</i>			
Applied Thin Films Inc.	909A	<i>Mixing/Milling/Grinding</i>	
Goodfellow Corporation	906	Across International	504
<i>Software Providers</i>			
Carl Zeiss Microscopy, LLC.	700	Fritsch Milling & Sizing, Inc.....	710
International Centre for Diffraction Data (ICDD)	807	<i>Powder Metallurgy</i>	
METTLER TOLEDO	508	Across International	504
MIPAR Software LLC	801	<i>Vacuum Degassing</i>	
OTHER SERVICES			
<i>Consulting Services</i>			
CAMECA	718	<i>Welding/Joining</i>	
MIPAR Software LLC	801	Across International	504
NSL Analytical Services	722	PUBLICATIONS (JOURNALS, BUSINESS MAGAZINES)	
<i>Contract R & D Services</i>			
Applied Thin Films Inc.	909A	<i>Publications</i>	
CAMECA	718	International Centre for Diffraction Data (ICDD)	807
Orton Ceramic Foundation	814	REFRACTORIES/FURNACE INSULATION	
<i>Nanotechnologies</i>			
Applied Thin Films Inc.	909A	<i>Refractories - Furnace Insulation</i>	
CAMECA	718	Thermcraft Inc.	905
TESCAN	601	SERVICES - MATERIALS INFORMATION RESOURCES	
<i>Software Providers</i>			
International Centre for Diffraction Data (ICDD)	807	<i>Engineering Software</i>	
MIPAR Software LLC	801	MIPAR Software LLC	801
PLASTICS			
<i>Polymers</i>			
Goodfellow Corporation	906	Thermo Calc Software Inc.	600
POWDER METALLURGY (P/M) MATERIALS			
<i>Ceramic & Metallic Powder</i>			
Goodfellow Corporation	906	<i>Engineering/Scientific Journals</i>	
PROCESSES			
<i>Alloy Production</i>			
Across International	504	International Centre for Diffraction Data (ICDD)	807
<i>Heat Treating</i>			
<i>Machining/Grinding</i>			
<i>Mixing/Milling/Grinding</i>			
<i>Powder Metallurgy</i>			
<i>Vacuum Degassing</i>			
<i>Welding/Joining</i>			
<i>Refractories - Furnace Insulation</i>			
<i>Services - Materials Information Resources</i>			
<i>Engineering Software</i>			
<i>Engineering/Scientific Journals</i>			
<i>Research & Development</i>			
<i>Technology Transfer</i>			
<i>Services - Parts/Materials Processing</i>			
<i>Machining, Grinding, Cutting, Drilling</i>			
Metcut Research Inc. 501			
WELDING AND JOINING EQUIPMENT			
<i>Solders</i>			
Across International			
Thermo Calc Software Inc. 600			

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The American Ceramic Society Anti-Harassment Policy (PDF)

ceramics.org/wp-content/uploads/2020/01/Appendix-8-Code-of-Conduct.pdf

Association For Iron and Steel Technology

haist.org/about-aist/leadership-governance/governance-policies

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tms.org/CodeofConductPolicies

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