

MRS **Bulletin**

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Cryogenic electron microscopy in materials science



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LATE NEWS—HOT TOPIC ABSTRACTS

ACCEPTED DECEMBER 18, 2019 – JANUARY 15, 2020

Spring Meeting registrations include MRS Membership July 1, 2020 – June 30, 2021

CHARACTERIZATION AND THEORY

- CT01 Artificial Intelligence for Material Design, Processing and Characterizations
- CT02 Halide Perovskites—
From Lead-Free Materials to Advanced Characterization and Deposition Approaches
- CT03 Expanding the Frontiers of Actinide Materials Science
Through Experiment and Theory
- CT04 Tailored Interphases for High Strength and Functional Composites—
Advances in Experiments, Simulations and AI-Based Design
- CT05 Defects, Order and Disorder in Structural and Functional Fluorite-Related Compounds
- CT06 Local and Global Fluctuations in Plasticity
- CT07 Micro-Assembly Technologies and Heterogeneous Integration—
Fundamentals to Applications
- CT08 Crystallization via Nonclassical Pathways in Synthetic, Biogenic
and Geologic Environments

ELECTRONICS AND PHOTONICS

- EL01 Surfaces and Interfaces in Electronics and Photonics
- EL02 Advanced Manufacturing of Mixed Dimensional Heterostructures
- EL03 Novel Approaches and Material Platforms for Enhanced Light–Matter Interaction,
Plasmonics and Metasurfaces
- EL04 Materials for Nonlinear and Nonreciprocal Photonics
- EL05 Scalable Photonic Material Platforms—Applications and Manufacturing Advances
- EL06 Photonic Materials for Information Processing and Computing
- EL07 Fundamental Mechanisms and Materials Discovery for Brain-Inspired Computing—
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- EL09 Phase-Change Materials for Electronic and Photonic Nonvolatile Memory
and Neuro-Inspired Computing
- EL10 Electroactive Ceramics for Information Technologies and Flexible Electronics
- EL11 Lead-Free Ferroelectrics and Their Emerging Applications
- EL12 Ferroc Materials and Heterostructures for Electronics and Data Storage
- EL13 Processing, Microstructure and Multifunctioning of Organic Semiconductors
- EL14 New Materials Design for Organic Semiconductors Through Multimodal
Characterization and Computational Techniques
- EL15 Ultra-Wide Bandgap Materials, Devices and Systems

ENERGY, STORAGE AND CONVERSION

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- EN02 Caloric Materials for Sustainable Cooling Applications
- EN03 Solar-Energy Conversion for Sustainable Water-Energy-Environmental Nexus
- EN04 Dual-Ion Batteries as an Emerging Technology for Sustainable Energy Storage—
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- EN05 Low-Cost Aqueous Rechargeable Battery Technologies
- EN06 Rational Designed Hierarchical Nanostructures for Photocatalytic System
- EN07 Next-Generation Electrical Energy Storage—Beyond Intercalation-Type Lithium Ion
- EN08 Multivalent-Based Electrochemical Energy Storage
- EN09 Flow-Based Open Electrochemical Systems
- EN10 Emerging Inorganic Semiconductors for Solar-Energy Conversion
- EN11 Materials, Modeling and Technoeconomic Impacts for Large-Scale
Hydrogen and Energy Applications
- EN12 Materials for Safe and Sustainable Electrochemical Energy Storage

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- NM01 Nanodiamonds—Synthesis, Properties and Applications
- NM02 Colloidal Nanoparticles—From Synthesis to Applications
- NM03 Nanomanipulation of Materials
- NM04 Nanosafety
- NM05 1D Carbon Electronics—From Synthesis to Applications
- NM06 Theory and Characterization of 2D Materials—
Bridging Atomic Structure and Device Performance
- NM07 Two-Dimensional Quantum Materials Out of Equilibrium
- NM08 2D Atomic and Molecular Sheets—
Electronic and Photonic Properties and Device Applications
- NM09 Layered van der Waals Heterostructures—
Synthesis, Physical Phenomena and Devices
- NM10 Synthesis, Properties and Applications of 2D MXenes
- NM11 Topological and Quantum Phenomena in Oxides and Oxide Heterostructures
- NM12 Synthesis and Control of Dirac or Topological Materials

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- SM02 Progress in Open-Space Microfluidics—
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- SM09 Advances in 3D Printing for Medical Applications

Meeting Chairs

- Qing Cao** University of Illinois at Urbana-Champaign
- Miyoung Kim** Seoul National University
- Rajesh Naik** Air Force Research Laboratory
- James M. Rondinelli** Northwestern University
- Hong Wang** Southern University of Science and Technology

Don't Miss These Future MRS Meetings!

2020 MRS Fall Meeting & Exhibit
November 29–December 4, 2020, Boston, Massachusetts

2021 MRS Spring Meeting & Exhibit
April 19–23, 2021, Seattle, Washington

FOLLOW THE MEETING!

#S20MRS  

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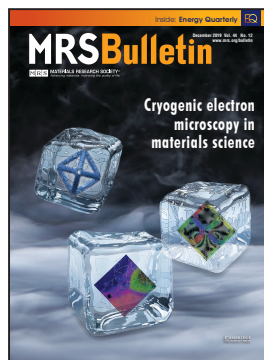
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ON THE COVER

Cryogenic electron microscopy in materials science. Cryogenic transmission electron microscopy (cryo-TEM) is simply transmission electron microscopy conducted on specimens that are cooled in the microscope. The ability to probe chemistry, structure, and bonding on the atomic scale in the temperature range from a few Kelvin to room temperature in structural and functional materials in a variable temperature transmission electron microscope is an intriguing prospect that will open up many new areas of materials research. The articles in this issue of *MRS Bulletin* explore the current capabilities, future developments, and opportunities

for cryogenic electron microscopy in materials science. The cover shows (top) a cryo-TEM reconstruction of a polyhedral wireframe DNA nanoparticle with a designed octahedral shape (Courtesy of H. Jun et al., *ACS Nano* **13**, 2083 [2019]); (right) a nanoscale magnetic structure of individual magnetic monopoles in an artificially frustrated 2D square spin-ice lattice (Courtesy of C. Phatak et al. *Phys. Rev. B* **83**, 174431 [2011]); and (left) a simultaneously acquired cryo-STEM electron energy-loss spectroscopy map (Courtesy of M. Zachman). See the technical theme that begins on p. 924.



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About the Materials Research Society

The Materials Research Society (MRS), a not-for-profit scientific association founded in 1973 and headquartered in Warrendale, Pennsylvania, USA, promotes interdisciplinary materials research. Today, MRS is a growing, vibrant, member-driven organization of over 16,000 materials researchers spanning over 80 countries, from academia, industry, and government, and a recognized leader in the advancement of interdisciplinary materials research.

The Society's interdisciplinary approach differs from that of single-discipline professional societies because it promotes information exchange across many scientific and technical fields touching materials development. MRS conducts three major international annual meetings and also sponsors numerous single-topic scientific meetings. The Society recognizes professional and technical excellence and fosters technical interaction through University Chapters. In the international arena, MRS implements bilateral projects with partner organizations to benefit the worldwide materials community. The Materials Research Society Foundation helps the Society advance its mission by supporting various projects and initiatives.

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