MRS Communications

VOLUME 9 • NO 2, 2019

A publication of the

MRS MATERIALS RESEARCH SOCIETY
Advancing materials. Improving the quality of life.

CAMBRIDGE UNIVERSITY PRESS

https://doi.org/10.1557/mrc.2019.76 Published online by Cambridge University Press

MRS COMMUNICATIONS

MRS Communications is a high-impact archival journal focusing on rigorous peer review and rapid publication of completed research with broad appeal to the materials community. Major article types include rapid communications (research letters), "prospectives" papers, correspondence and commentaries.

"Prospectives" are a unique feature of this Journal offering succinct and forward-looking reviews of topics of interest to a broad materials research readership. This modern journal features advanced on-line publication, in full color, acceptance of supplemental materials, and multimedia content. *MRS Communications* leverages the deep technical expertise of leading MRS members among its editorial board and reviewers under the governance of a team of Principal Editors, and the advanced author and reader publication services and academic standing offered by Cambridge Journals.

Manuscript submissions that succinctly describe groundbreaking work in the broad field of materials research are encouraged. Examples of leading topical areas of interest to *MRS Communications* readers include:

- Biomaterials and biomimetic materials
- Carbon-based materials
- Complex oxides and their interfaces
- Materials for energy storage, conversion and environmental remediation
- Materials for nanophotonics and plasmonic devices
- Theory and simulation of materials
- Mechanical behavior at the nanoscale
- Nanocrystal growth, structures and properties, including nanowires and nanotubes
- Nanoscale semiconductors for new electronic and photonic applications
- New materials synthesis, templating and assembly methods
- New topics in metals, alloys and transformations
- Novel and *in-situ* characterization methods
- Novel catalysts and sensor materials
- Organic and hybrid functional materials
- Quantum matter
- Surface, interface and length-scale effects on materials properties

Author queries and submissions

MRS Communications operates a fully online author submission and peer review system, which can be found at http://mc.manuscriptcentral.com/mrscom

For questions related to *MRS Communications*, please contact mrc@mrs.org

MRS Communications Article Types

Prospectives

Forward-looking short reviews. Authoritative and balanced, but can deal with controversies or new and speculative areas of research for future consideration.

Research Letters

A concise presentation of a study with broad interest, showing novel results.

Editorials

Opinion piece, policy statement, or general commentary, typically written by board of the publication or a guest of notable stature.

Commentaries

An item whose subject or focus is another article or articles; this article comments on the other article(s).

Correspondence

Letter to the editor/publication, typically commenting upon a published item.

See complete technical descriptions online at www.mrs.org/mrc-article-types

Copyright © 2019, Materials Research Society. All rights reserved. No part of this publication may be reproduced, in any form or by any means, electronic, photocopying, or otherwise, without permission in writing from Cambridge University Press. Policies, request forms and contacts are available at: http://www.cambridge.org/rights/permissions/permission.htm. Permission to copy (for users in the U.S.A.) is available from Copyright Clearance Center http://www.copyright.com, email: info@copyright.com.

MRS Communications Subscription Prices (2019)

Institutions
Online only
$870.00 / £664.88
Print-on-Demand available to online subscribers.
Inquire Customer Services.

MRS Communications (ISSN: 2159-6859) is published four times a year by Cambridge University Press for the Materials Research Society.

Individual member subscriptions are for personal use only.

https://doi.org/10.1557/mrc.2019.76 Published online by Cambridge University Press

MRS Communications

Editor-in-Chief: Rigoberto Advincula, *Case Western Reserve University, USA*

Principal Editors

Luca Dal Negro, *Boston University, USA*
Jason Locklin, *University of Georgia, USA*
Róisín Owens, *University of Cambridge, United Kingdom*
Derek Patton, *University of Southern Mississippi, USA*
Alberto Salleo, *Stanford University, USA*
Shinji Takeoka, *Waseda University, Japan*

MRS Communications **Advisory Board**

Jodie Bradby, *The Australian National University, Australia*
Horacio Espinosa, *Northwestern University, USA*
A. Lindsay Greer, *Cambridge University, United Kingdom*
Supratik Guha, *Argonne National Laboratory/University of Chicago, USA*
Howard E. Katz, *Johns Hopkins University, USA*
Nicholas A. Kotov, *University of Michigan, USA*
George Malliaras, *Cambridge University, United Kingdom*
Tobin Marks, *Northwestern University, USA*
Andrew M. Minor, *University of California, Berkeley and Lawrence Berkeley National Laboratory, USA*
Linda F. Nazar, *University of Waterloo, Canada*
Kenichi Oyaizu, *Waseda University, Japan*
Ramamoorthy Ramesh, *University of California, Berkeley, USA*
Venkatesan Renugopalakrishnan, *Northeastern University and Boston Children's Hospital, USA*
Henning Riechert, *Paul Drude Institut für Festkörperelektronik, Germany*
Thomas P. Russell, *University of Massachusetts, USA*
Darrel G. Schlom, *Cornell University, USA*
James S. Speck, *University of California, Santa Barbara, USA*
Alec Talin, *Sandia National Laboratory, USA*
Katsuyo Thornton, *University of Michigan, USA*
Vladimir V. Tsukruk, *Georgia Institute of Technology, USA*
Nagarajan (Nagy) Valanoor, *The University of New South Wales, Australia*
Suresh Valiyaveettil, *National University of Singapore, Singapore*

Editorial Office:

Ellen W. Kracht, *Publications Manager, Materials Research Society, Warrendale, PA*
Kirby L. Morris, *Production Assistant, Materials Research Society, Warrendale, PA*
Eileen M. Kiley, *Director of Communications, Materials Research Society, Warrendale, PA*

https://doi.org/10.1557/mrc.2019.76 Published online by Cambridge University Press

MRS Communications

Volume 9, Number 2, June 2019

Synthetic Biology Prospective

421–432 **Coupling synthetic biology and programmable materials to construct complex tissue ecosystems** — Catherine S. Millar-Haskell, Allyson M. Dang, Jason P. Gleghorn

Synthetic Biology Research Letter

433–440 **Engineering CAR-expressing natural killer cells with cytokine signaling and synthetic switch for an off-the-shelf cell-based cancer immunotherapy** — Yun Qu, Elizabeth Siegler, Chumeng Cheng, Jiangyue Liu, Gunce Cinay, Neelesh Bagrodia, Pin Wang

Synthetic Biology Prospective

441–455 **Towards the directed evolution of protein materials** — Anton Kan, Neel S. Joshi

Synthetic Biology Research Letters

456–463 **Identification of proteins for controlled nucleation of metal-organic crystals for nanoenergetics** — Zachary E. Reinert, Chia-Suei Hung, Andrea R. Poole, Joseph M. Slocik, Marquise G. Crosby, Srikanth Singamaneni, Rajesh R. Naik, Patrick B. Dennis, Wendy J. Crookes-Goodson, Maneesh K. Gupta

464–473 **Bioderived protoporphyrin IX incorporation into a metal-organic framework for enhanced photocatalytic degradation of chemical warfare agents** — Marilyn S. Lee, Sergio J. Garibay, Ann M. Ploskonka, Jared B. DeCoste

Synthetic Biology Prospectives

474–485 **Synthetic biology for the development of bio-based binders for greener construction materials** — Virginia Echavarri-Bravo, Ian Eggington, Louise E. Horsfall

486–504 **Synthetic biology for fibers, adhesives, and active camouflage materials in protection and aerospace** — Aled D. Roberts, William Finnigan, Emmanuel Wolde-Michael, Paul Kelly, Jonny J. Blaker, Sam Hay, Rainer Breitling, Eriko Takano, Nigel S. Scrutton

505–517 **Engineered living conductive biofilms as functional materials** — Lina J. Bird, Elizabeth L. Onderko, Daniel A. Phillips, Rebecca L. Mickol, Anthony P. Malanoski, Matthew D. Yates, Brian J. Eddie, Sarah M. Glaven

Artificial Intelligence Prospectives

518–531 **A Bayesian framework for materials knowledge systems** — Surya R. Kalidindi

532–536 **Monte Carlo tree search for materials design and discovery** — Thaer M. Dieb, Shenghong Ju, Junichiro Shiomi, Koji Tsuda

537–544 **Challenges and opportunities of polymer design with machine learning and high throughput experimentation** — Jatin N. Kumar, Qianxiao Li, Ye Jun

545–555 **Automating material image analysis for material discovery** — Chiwoo Park, Yu Ding

556–566 **Machine learning for composite materials** — Chun-Teh Chen, Grace X. Gu

https://doi.org/10.1557/mrc.2019.76 Published online by Cambridge University Press

Artificial Intelligence Research Letters

567–575	**Exploring effective charge in electromigration using machine learning**	Yu-chen Liu, Benjamin Afflerbach, Ryan Jacobs, Shih-kang Lin, Dane Morgan
576–585	**Machine learning prediction of elastic properties and glass-forming ability of bulk metallic glasses**	Jie Xiong, Tong-Yi Zhang, San-Qiang Shi
586–592	**Convolutional neural networks for grazing incidence x-ray scattering patterns: thin film structure identification**	Shuai Liu, Charles N. Melton, Singanallur Venkatakrishnan, Ronald J. Pandolfi, Guillaume Freychet, Dinesh Kumar, Haoran Tang, Alexander Hexemer, Daniela M. Ushizima
593–599	**Parameterization of empirical forcefields for glassy silica using machine learning**	Han Liu, Zipeng Fu, Yipeng Li, Nazreen Farina Ahmad Sabri, Mathieu Bauchy
600–608	**CRYSTAL: a multi-agent AI system for automated mapping of materials' crystal structures**	Carla P. Gomes, Junwen Bai, Yexiang Xue, Johan Björck, Brendan Rappazzo, Sebastian Ament, Richard Bernstein, Shufeng Kong, Santosh K. Suram, R. Bruce van Dover, John M. Gregoire
609–617	**Using convolutional neural networks to predict composite properties beyond the elastic limit**	Charles Yang, Youngsoo Kim, Seunghwa Ryu, Grace X. Gu
618–627	**ESPEI for efficient thermodynamic database development, modification, and uncertainty quantification: application to Cu–Mg**	Brandon Bocklund, Richard Otis, Aleksei Egorov, Abdulmonem Obaied, Irina Roslyakova, Zi-Kui Liu
628–636	**Designing heterogeneous hierarchical material systems: a holistic approach to structural and materials design**	Emily Ryan, Zoe A. Pollard, Quang-Thinh Ha, Athar Roshandelpoor, Pirooz Vakili, Jillian L. Goldfarb

Research Letters

637–643	**Biomimetic non-uniform nanostructures reduce broadband reflectivity in transparent substrates**	Alexandra A. Sourakov, Ahmed Al-Obeidi
644–649	**Dynamic covalent hexahydrotriazine breakdown through nucleophilic attack by phosphine**	Peter J. Boul, Diana K. Rasner, Peter D. Jarowski, Carl J. Thaemlitz
650–656	**Scanning thermal probe calibration for accurate measurement of thermal conductivity of ultrathin films**	Adam A. Wilson
657–662	**Interface effects on self-forming rechargeable Li/I_2-based solid state batteries**	Alyson Abraham, Mikaela R. Dunkin, Jianping Huang, Bingjie Zhang, Kenneth J. Takeuchi, Esther S. Takeuchi, Amy C. Marschilok
663–669	**Excitonic nonlinear optical properties in AlN/GaN spherical core/shell quantum dots under pressure**	N. Aghoutane, M. El-Yadri, A. El Aouami, E. Feddi, G. Long, M. Sadoqi, F. Dujardin, Chuong V. Nguyen, Nguyen N. Hieu, Huynh V. Phuc
670–674	**CNT flexible membranes for energy storage and conversion systems**	Kofi Adu, Ramakrishnan Rajagopalan, Cullen Kaschalk, Clive Randall
675–681	**Effective reduction of building heat loss without insulation materials via the photothermal effect of a chlorophyll thin film coated "Green Window"**	Yuan Zhao, Andrew W. Dunn, Donglu Shi

https://doi.org/10.1557/mrc.2019.76 Published online by Cambridge University Press

682–689	**Increasing surface charge density by effective charge accumulation layer inclusion for high-performance triboelectric nanogenerators**	Aravind Narain Ravichandran, Marc Ramuz, Sylvain Blayac
690–696	**Tension gradient self-assembly to facilely fabricate polytetrafluoroethylene coatings for oil–water separation**	Dong Feng, Ding Weng, Chaolang Chen, Jiadao Wang
697–701	**The effect of substrate roughness on the properties of RF sputtered AZO thin film**	Kairi Hamada, Takaya Ogawa, Hideyuki Okumura, Keiichi N. Ishihara
702–709	**Fluorescence loss of commercial aqueous quantum dots during preparation for bioimaging**	Kil Ho Lee, Thomas Porter, Jessica O. Winter
710–718	**Quartz tuning fork as a mass sensitive biosensor platform with a bi-layer film modification via plasma polymerization**	Hatice Ferda Özgüzar, Gizem Kaleli Can, Gözde Kabay, Mehmet Mutlu
719–725	**Self-assembly synthesis of AgNPs@g-C_3N_4 composite with enhanced electrochemical properties for supercapacitors**	D.F. Wang, Y.Z. Wu, X.H. Yan, J.J. Wang, Q. Wang, C. Zhou, X.X. Yuan, J.M. Pan, X.N. Cheng
726–729	**Renewable supercapacitors based on cellulose/carbon nanotubes/ [Bmim][NTf_2] ionic liquid**	Bruno S. Noremberg, Ricardo M. Silva, Oscar G. Paniz, José H. Alano, Jairton Dupont, Neftali L. V. Carreño
730–736	**Identifying hidden high-dimensional structure/property relationships using self-organizing maps**	Amanda S. Barnard, Benyamin Motevalli, Baichuan Sun
737–743	**Optical microcrack sensor paints inspired by luminescent oxygen quenching phenomenon**	Tsuyoshi Hyakutake, Hiroyuki Nitta, Itaru Nishizaki
744–749	**Preparation and adsorption performance research of large-volume hollow mesoporous polydopamine microcapsules**	Caihong Tao, Tiandi Chen, Hui Liu, Sisi Su
750–755	**Combinatorial thin film screening to identify single-phase, non-equiatomic high entropy alloys in the MnFeCoNiCu system**	Azin Akbari, Thomas J. Balk
756–763	**Finite element modeling and simulations on indentation and scratch tests on thin films: effects of prestress**	Biao Feng, Zhen Liu
764–772	**Electrospinning and post-drawn processing effects on the molecular organization and mechanical properties of polyacrylonitrile (PAN) nanofibers**	David A. Brennan, Khosro Shirvani, Cailyn D. Rhoads, Samuel E. Lofland, Vince Z. Beachley
773–777	**Plastic deformation affecting anodic dissolution in electrochemical migration**	Yasuhiro Kimura, Shoya Wakayama, Masumi Saka

https://doi.org/10.1557/mrc.2019.76 Published online by Cambridge University Press