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# CHEMISTRY OF MATERIALS

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**ON THE COVER:** Microwave radiation activates the reduction of bismuth nitrate and trimeric palladium acetate in ethylene glycol yielding intermetallic nanoparticles. For more information, see "Full Access to Nanoscale Bismuth–Palladium Intermetallics" by Martin Heise, Jen-Hui Chang, Rico Schönemann, Thomas Herrmannsdörfer, Joachim Wosnitza, and Michael Ruck\* (*Chem. Mater.* 2014, 26, 5640–5646).

## Editorial

5421

Growth at *Chemistry of Materials*  
Jillian M. Buriak

[dx.doi.org/10.1021/cm5033767](http://dx.doi.org/10.1021/cm5033767)

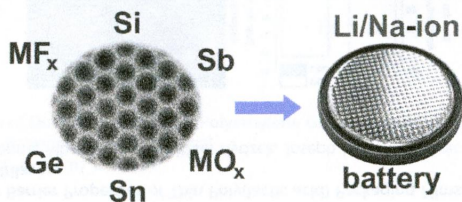
## Perspectives

5422

Precisely Engineered Colloidal Nanoparticles and Nanocrystals for Li-Ion and Na-Ion Batteries: Model Systems or Practical Solutions?

Marek F. Oszajca, Maryna I. Bodnarchuk, and Maksym V. Kovalenko\*

[dx.doi.org/10.1021/cm5024508](http://dx.doi.org/10.1021/cm5024508)



## Communications

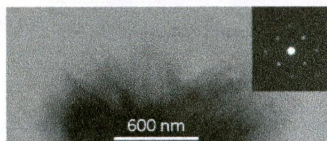
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Thickness-Controlled Synthesis of Colloidal PbS Nanosheets and Their Thickness-Dependent Energy Gaps

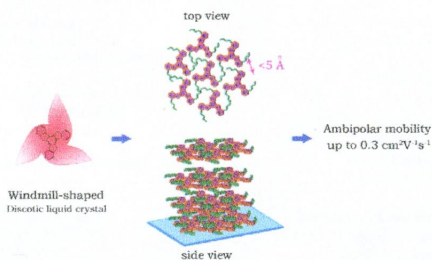
Ghadendra B. Bhandari, Kamal Subedi, Yufan He, Zhoufeng Jiang, Matthew Leopold, Nick Reilly, H. Peter Lu, Alexey T. Zayak, and Liangfeng Sun\*

[dx.doi.org/10.1021/cm502524z](http://dx.doi.org/10.1021/cm502524z)



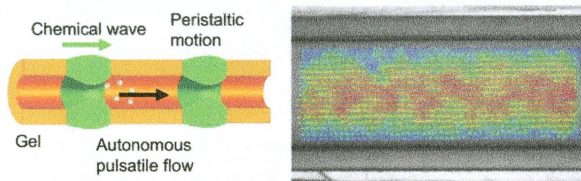
### A Windmill-Shaped Discotic Columnar Liquid Crystal with Fast Ambipolar Charge Carrier Transport

XuYing Liu, Takayuki Usui, and Junlchi Hanna\*



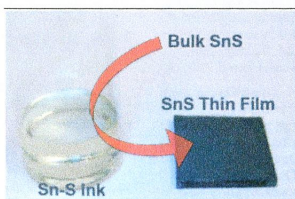
### Autonomous Pulsatile Flow by Peristaltic Motion of Tubular Self-Oscillating Gels

Yusuke Shiraki, Aya Mizutani Akimoto, Takashi Miyata, and Ryo Yoshida\*



### Low Temperature Solution-Phase Deposition of SnS Thin Films

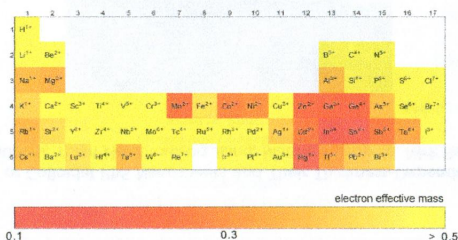
Priscilla D. Antunez, Daniel A. Torelli, Fan Yang, Federico A. Rabuffetti, Nathan S. Lewis,\* and Richard L. Brutchey\*



5447

dx.doi.org/10.1021/cm404079a

**How Does Chemistry Influence Electron Effective Mass in Oxides? A High-Throughput Computational Analysis**  
 Geoffroy Hautier,\* Anna Miglio, David Waroquiers, Gian-Marco Rignanese, and Xavier Gonze



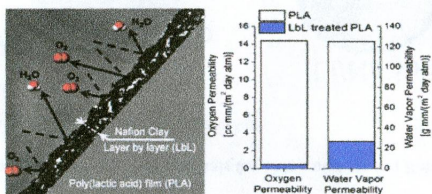
5459



dx.doi.org/10.1021/cm501359e

**Efficient Gas and Water Vapor Barrier Properties of Thin Poly(lactic acid) Packaging Films: Functionalization with Moisture Resistant Nafion and Clay Multilayers**

Federico Carosio, Samuele Colonna, Alberto Fina, Gauthier Rydzek, Joseph Hemmerlé, Loïc Jiery, Pierre Schaaf,\* and Fouzia Boulmedais

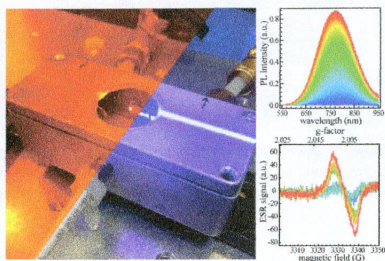


5467

dx.doi.org/10.1021/cm5008125

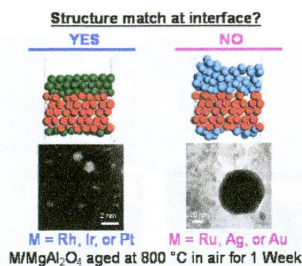
**Light-Induced Evolution of Silicon Quantum Dot Surface Chemistry—Implications for Photoluminescence, Sensing, and Reactivity**

Ross Lockwood, Zhenyu Yang, Ramaswami Sammynaiken, Jonathan G. C. Veinot, and Al Meldrum\*

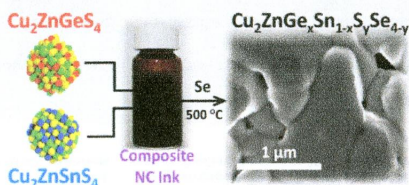


## A General Mechanism for Stabilizing the Small Sizes of Precious Metal Nanoparticles on Oxide Supports

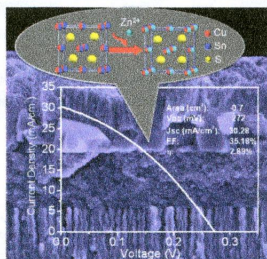
Wei-Zhen Li, Libor Kovarik, Donghai Mei, Mark H Engelhard, Feng Gao, Jun Liu,\* Yong Wang,\* and Charles H. F. Peden\*

Cu<sub>2</sub>ZnGeS<sub>4</sub> Nanocrystals from Air-Stable Precursors for Sintered Thin Film Alloys

Anthony S. R. Chesman,\* Joel van Embden, Enrico Della Gaspera, Noel W. Duffy, Nathan A. S. Webster, and Jacek J. Jasieniak\*

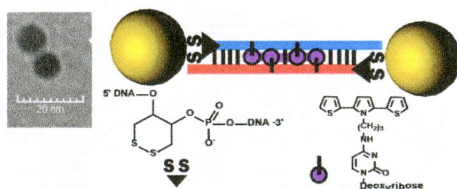
Phase-Selective Synthesis of Cu<sub>2</sub>ZnSnS<sub>4</sub> Nanocrystals through Cation Exchange for Photovoltaic Devices

Yi-Xiu Wang, Ming Wei, Feng-Jia Fan, Tao-Tao Zhuang, Liang Wu, Shu-Hong Yu,\* and Chang-Fei Zhu\*



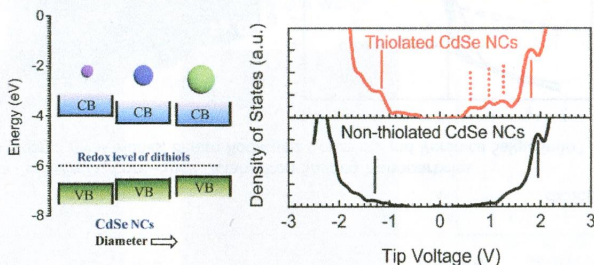
### Modular-DNA Programmed Molecular Construction of "Fixed" of 2D and 3D-Au Nanoparticle Arrays

Zhijie Ma, Wen Chen, Matthew C. Johnson, Ingeborg Schmidt-Krey, Loren Williams, and Gary B. Schuster\*



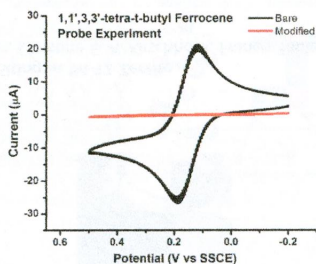
### Redox Levels of Dithiols in II–VI Quantum Dots vis-à-vis Photoluminescence Quenching: Insight from Scanning Tunneling Spectroscopy

Biswajit Kundu, Suddipto Chakrabarti, and Amlan J. Pal\*



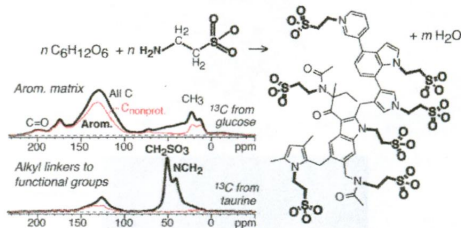
### Synthesis and Characterization of Diazonium Salts with Polyethylene Glycol Appendages and Resulting Films Afforded by Electrodeposition for Use as a Battery Separator Material

Daniel J. Bates, C. Michael Elliott, and Amy L. Prieto\*



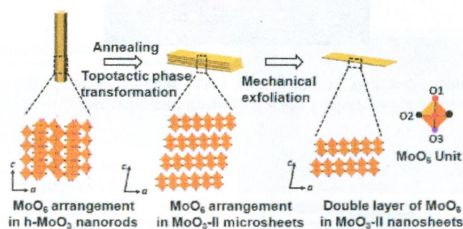
### Simple One-Step Synthesis of Aromatic-Rich Materials with High Concentrations of Hydrothermally Stable Catalytic Sites, Validated by NMR

Robert L. Johnson, Jason M. Anderson, Brent H. Shanks, and Klaus Schmidt-Rohr\*



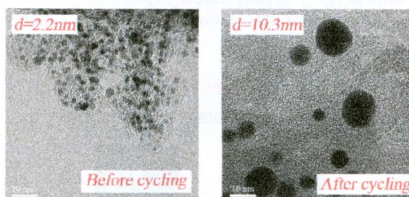
### Topotactic Phase Transformation of Hexagonal $\text{MoO}_3$ to Layered $\text{MoO}_3\text{-II}$ and Its Two-Dimensional (2D) Nanosheets

Vipin Kumar, Afriyanti Sumboja, Jiangxin Wang, Venkateswarlu Bhavanasi, Viet Cuong Nguyen, and Pool See Lee\*



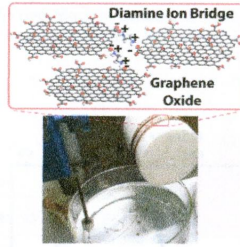
### Degradation Mechanisms of Platinum Nanoparticle Catalysts in Proton Exchange Membrane Fuel Cells: The Role of Particle Size

Kang Yu, Daniel J. Groom, Xiaoping Wang, Zhiwei Yang, Mallika Gummalla, Sarah C. Ball, Deborah J. Myers, and Paulo J. Ferreira\*



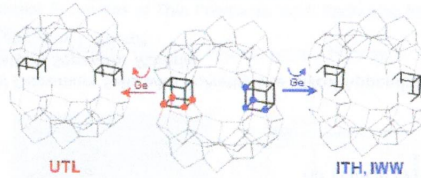
## Easy Preparation of Readily Self-Assembled High-Performance Graphene Oxide Fibers

Yern Seung Kim, Jong Hun Kang, Tae-hoon Kim, Yeonsu Jung, Kunsil Lee, Jun Young Oh, Jisoo Park, and Chong Rae Park\*

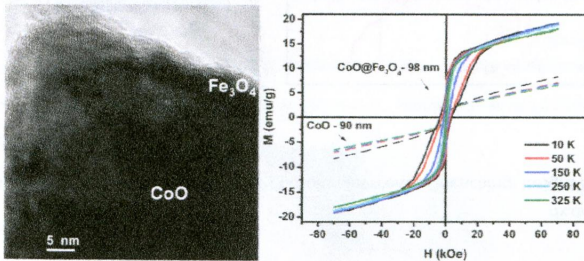


## NMR Evidence for Specific Germanium Siting in IM-12 Zeolite

Natalia Kasian, Alain Tuel,\* Elke Verheyen, Christine E. A. Kirschhock, Francis Taulelle, and Johan A. Martens

Exchange Bias Effect in  $\text{CoO@Fe}_3\text{O}_4$  Core-Shell Octahedron-Shaped Nanoparticles

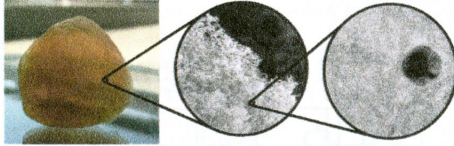
Nerio Fontañá Troitino, Beatriz Rivas-Murias, Benito Rodríguez-González, and Verónica Salgueiriño\*





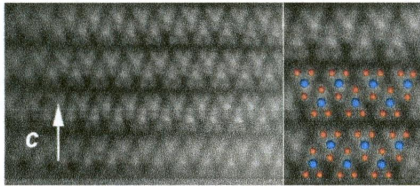
### Self-Assembly of Metal and Metal Oxide Nanoparticles and Nanowires into a Macroscopic Ternary Aerogel Monolith with Tailored Photocatalytic Properties

Florian J. Heiligtag, Wei Cheng, Vagner R. de Mendonça, Martin J. Süess, Kathrin Hametner, Detlef Günther, Caue Ribeiro, and Markus Niederberger\*



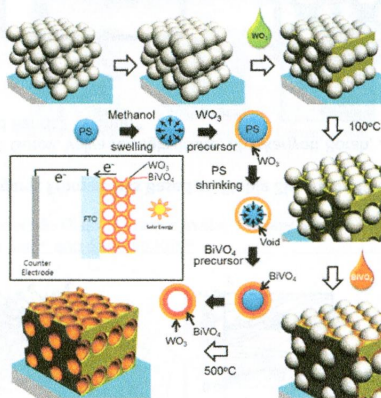
### ZrSe<sub>3</sub>-Type Variant of TiS<sub>3</sub>: Structure and Thermoelectric Properties

Emmanuel Guilmeau, David Berthebaud, Patrick R. N. Misse, Sylvie Hébert, Oleg I. Lebedev, Daniel Chateigner, Christine Martin, and Antoine Maignan\*



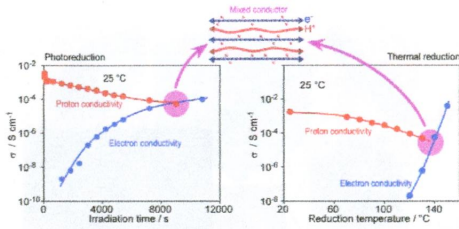
### Double-Deck Inverse Opal Photoanodes: Efficient Light Absorption and Charge Separation in Heterojunction

Ming Ma, Jung Kyu Kim, Kan Zhang, Xinjian Shi, Sung June Kim, Jun Hyuk Moon, and Jong Hyeok Park\*



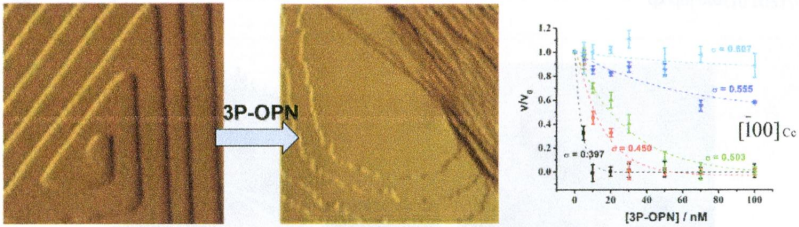
### Tunable Graphene Oxide Proton/Electron Mixed Conductor that Functions at Room Temperature

Kazuto Hatakeyama,\* Hikaru Tateishi, Takaaki Taniguchi, Michio Koinuma, Tetsuya Kida, Shinya Hayami, Hiroyuki Yokoi, and Yasumichi Matsumoto\*



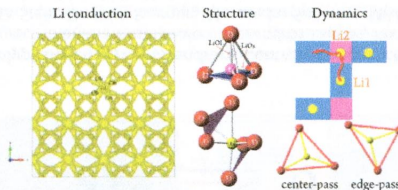
### Inhibition of Pathological Mineralization of Calcium Phosphate by Phosphorylated Osteopontin Peptides through Step-Specific Interactions

Shiyan Li, Shanshan Wu, Defeng Nan, Wenjun Zhang, and Lijun Wang\*



### Local Structure and Dynamics of Lithium Garnet Ionic Conductors: A Model Material $Li_5La_3Ta_2O_{12}$

Yuxing Wang, Matthew Klenk, Katharine Page, and Wei Lai\*

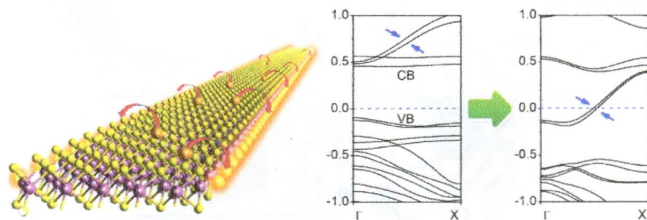


5625

dx.doi.org/10.1021/cm5021756

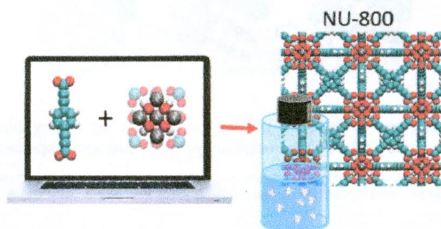
Edge-Specific Au/Ag Functionalization-Induced Conductive Paths in Armchair MoS<sub>2</sub> Nanoribbons

Weifeng Li, Meng Guo, Gang Zhang,\* and Yong-Wei Zhang\*

5632 **S**

dx.doi.org/10.1021/cm502304e

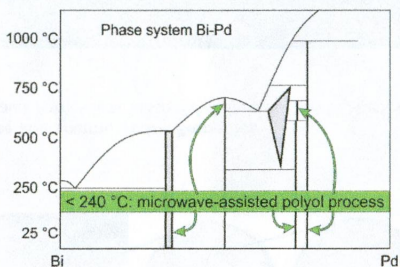
## Computational Design of Metal–Organic Frameworks Based on Stable Zirconium Building Units for Storage and Delivery of Methane

Diego A. Gomez-Gualdron, Oleksii V. Gutov, Vaiva Krungleviciute, Bhaskariyoti Borah, Joseph E. Mondloch, Joseph T. Hupp,\*  
Taner Yildirim,\* Omar K. Farha,\* and Randall Q. Snurr\*5640 **S**

dx.doi.org/10.1021/cm502315a

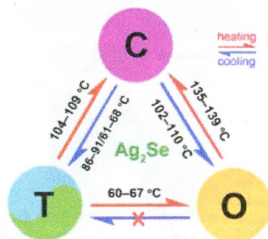
## Full Access to Nanoscale Bismuth–Palladium Intermetallics by Low-Temperature Syntheses

Martin Heise, Jen-Hui Chang, Rico Schönemann, Thomas Herrmannsdörfer, Joachim Wosnitza, and Michael Ruck\*

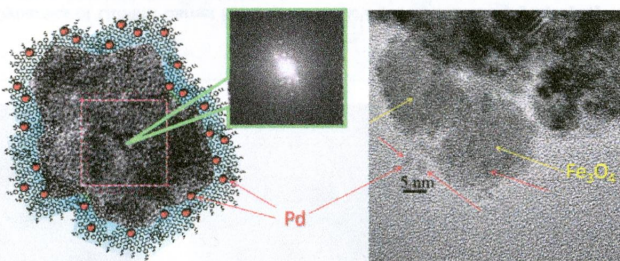


**Tetragonal–Orthorhombic–Cubic Phase Transitions in  $\text{Ag}_2\text{Se}$  Nanocrystals**

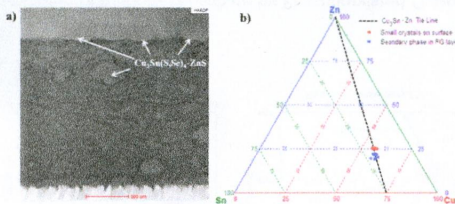
Junli Wang,\* Weiling Fan, Juan Yang, Zulin Da, Xiaofei Yang, Kangmin Chen, Huan Yu, and Xiaonong Cheng\*

**Hydrophobic Periphery Tails of Polyphenylenepyridyl Dendrons Control Nanoparticle Formation and Catalytic Properties**

Nina V. Kuchkina, David Gene Morgan, Athanasia Kostopoulou, Alexandros Lappas, Konstantinos Brintakis, Bethany S. Boris, Ekaterina Yu. Yuzik-Klimova, Barry D. Stein, Dmitri I. Svergun, Alessandro Spilotros, Mikhaill G. Sulman, Linda Zh. Nikoshvili, Esther M. Sulman, Zinaida B. Shifrina,\* and Lyudmila M. Bronstein\*

**Formation of Cu-Rich and Sn-Poor CZTSSe via  $\text{Cu}_3\text{Sn}(\text{S,Se})_4\text{-ZnS}$  Solid-Solution as the Intermediate**

Qijie Guo,\* Jonathan V. Caspar, Katherine E. Roelofs, Shekhar Subramoney, and H. David Rosenfeld

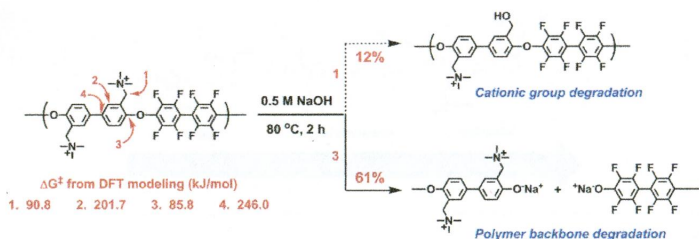


5675 **S**

dx.doi.org/10.1021/cm502422h

### Alkaline Stability of Benzyl Trimethyl Ammonium Functionalized Polyaromatics: A Computational and Experimental Study

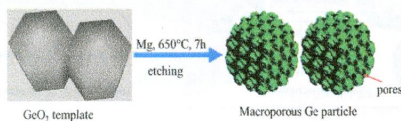
Young-Kee Choe, Cy Fujimoto, Kwan-Soo Lee, Luke T. Dalton, Kathy Ayers, Neil J. Henson, and Yu Seung Kim\*

5683 **S**

dx.doi.org/10.1021/cm5025124

### Reversible Storage of Lithium in Three-Dimensional Macroporous Germanium

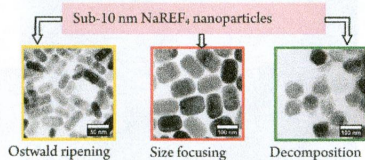
Haiping Jia, Richard Kloepsch, Xin He, Juan Pablo Badillo, Pengfei Gao, Olga Fromm, Tobias Placke,\* and Martin Winter\*

5689 **S**

dx.doi.org/10.1021/cm502532r

### Ostwald Ripening, Particle Size Focusing, and Decomposition of Sub-10 nm NaREF<sub>4</sub> (RE = La, Ce, Pr, Nd) Nanocrystals

A. Naduviledathu Raj, T. Rinkel, and M. Haase\*

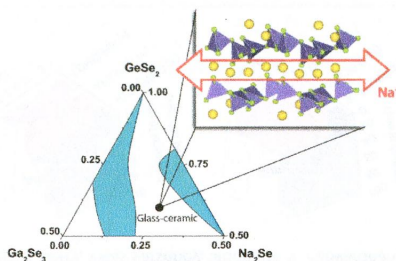


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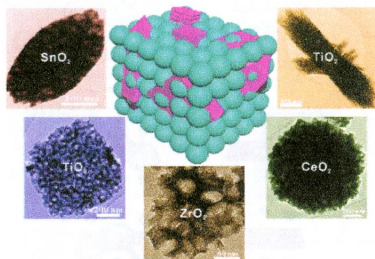
### Fast Na-Ion Conduction in a Chalcogenide Glass–Ceramic in the Ternary System Na<sub>2</sub>Se–Ga<sub>2</sub>Se<sub>3</sub>–GeSe<sub>2</sub>

Seong K. Kim, Alvin Mao, Sabyasachi Sen,\* and Sangtae Kim\*



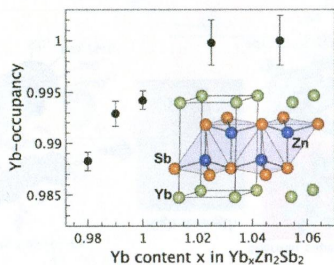
### Close-Packed Colloidal $\text{SiO}_2$ as a Nanoreactor: Generalized Synthesis of Metal Oxide Mesoporous Single Crystals and Mesocrystals

Xiaoli Zheng, Yinyun Lv, Qin Kuang, Zonglong Zhu, Xia Long, and Shihe Yang\*



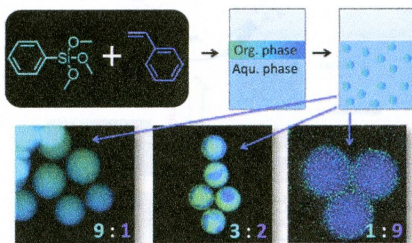
### Nonstoichiometry in the Zintl Phase $\text{Yb}_{1-x}\text{Zn}_x\text{Sb}_2$ as a Route to Thermoelectric Optimization

Alex Zevalkink, Wolfgang G. Zeier, Ethan Cheng, Jeffrey Snyder,\* Jean-Pierre Fleurial, and Sabah Bux\*



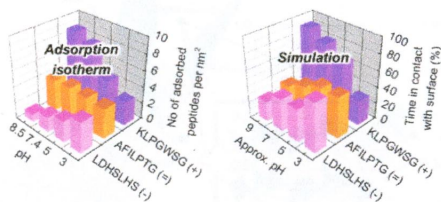
### Facile and Versatile Platform Approach for the Synthesis of Submicrometer-Sized Hybrid Particles with Programmable Size, Composition, and Architecture Comprising Organosiloxanes and/or Organosilsesquioxanes

Margot Segers, Ryan van Zandvoort, Marjolein Sliepen, Nanning Arfsten, Marcel Verheijen, Helmut Keul, Pascal Buskens,\* and Martin Möller\*

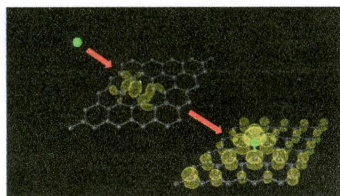


**Prediction of Specific Biomolecule Adsorption on Silica Surfaces as a Function of pH and Particle Size**

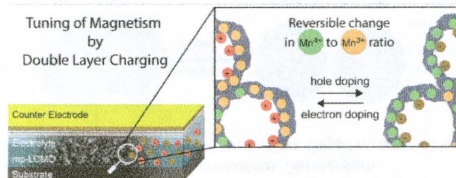
Fateme S. Emami, Valeria Puddu, Rajiv J. Berry, Vikas Varshney, Siddharth V. Patwardhan, Carole C. Perry,\* and Hendrik Heinz\*

**Periodic Trends of Phictogen Substitution into a Graphene Monovacancy: A First-Principles Investigation**

Paul A. Brown, Chengyong Xu, and Kevin L. Shuford\*

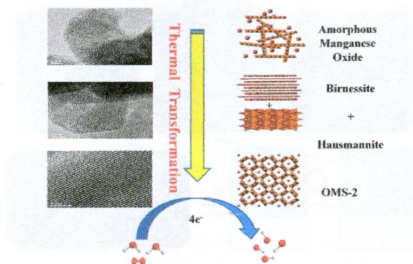
**Large Magnetoresistance and Electrostatic Control of Magnetism in Ordered Mesoporous La<sub>1-x</sub>Ca<sub>x</sub>MnO<sub>3</sub> Thin Films**

Christian Reitz, Philipp M. Leufke, Reinhard Schneider, Horst Hahn, and Torsten Brezesinski\*



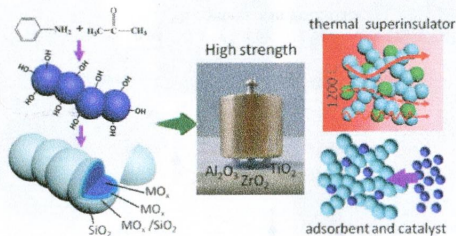
### X-ray Absorption Spectroscopic Study of a Highly Thermally Stable Manganese Oxide Octahedral Molecular Sieve (OMS-2) with High Oxygen Reduction Reaction Activity

Abdelhamid M. El-Sawy, Cecil K. King'ondo, Chung-Hao Kuo, David A. Kriz, Curtis J. Guild, Yongtao Meng, Samuel J. Frueh, Saminda Dharmarathna, Steven N. Ehrlich, and Steven L. Suib\*



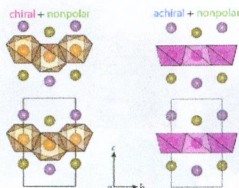
### Robust, Highly Thermally Stable, Core–Shell Nanostructured Metal Oxide Aerogels as High-Temperature Thermal Superinsulators, Adsorbents, and Catalysts

Guoqing Zu, Jun Shen,\* Wenqin Wang, Liping Zou, Ya Lian, Zhihua Zhang, Bin Liu, and Fan Zhang



### Microscopic Origins of Optical Second Harmonic Generation in Noncentrosymmetric–Nonpolar Materials

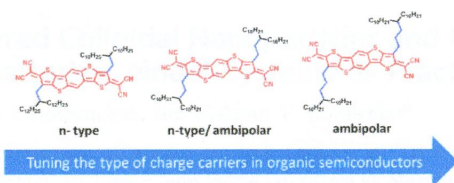
Antonio Cammarata,\* Weiguo Zhang, P. Shiv Halasyamani,\* and James M. Rondinelli\*





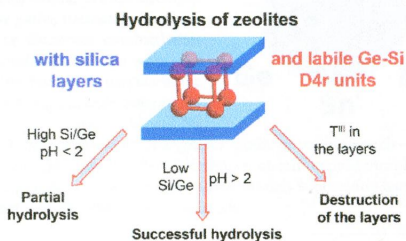
### Five-Ring Fused Tetracyanothienoquinoids as High-Performance and Solution-Processable n-Channel Organic Semiconductors: Effect of the Branching Position of Alkyl Chains

Jie Li, Xiaolan Qiao,\* Yu Xiong, Hongxiang Li,\* and Daoben Zhu



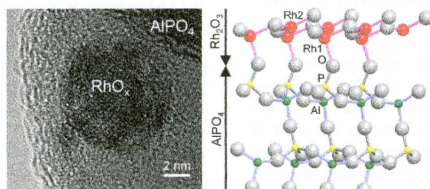
### Germanosilicate Precursors of ADORable Zeolites Obtained by Disassembly of ITH, ITR, and IWR Zeolites

Mariya Shamzhy, Maksym Opanasenko, Yuyang Tian, Kateryna Konyshova, Oleksiy Shvets, Russell E. Morris, and Jiří Čejka\*



### Rhodium Nanoparticle Anchoring on $\text{AlPO}_4$ for Efficient Catalyst Sintering Suppression

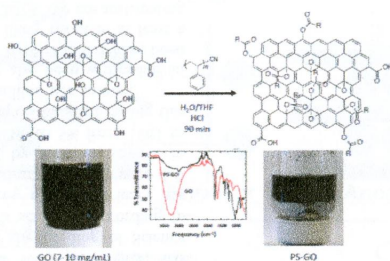
Masato Machida,\* Saki Minami, Keita Ikeue, Satoshi Hinokuma, Yuki Nagao, Takahiro Sato, and Yunusuke Nakahara



## Rapid Functionalization of Graphene Oxide in Water

Brendan T. McGrail, Bradley J. Rodier, and Emily Pentzer\*

dx.doi.org/10.1021/cm5031409



## In Situ Formation of Heterojunctions in Modified Graphitic Carbon Nitride: Synthesis and Noble Metal Free Photocatalysis

Menny Shalom,\* Miguel Guttentag, Christian Fettkenhauer, Sahika Inal, Dieter Neher, Antoni Llobet, and Markus Antonietti

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