Min-Rui Gao, Ph.D.
Curriculum Vitae
Last Updated 18/03/2015

MINRUI GAO, Ph.D.
Center for Nanoscale Materials
Argonne National Laboratory, Lemont, IL 60439, USA
Mobile Phone: 630-210-6846
Web: www.minrgao.weebly.com
Email: mgao@anl.gov

Education

2006 - 2012 Ph.D. in Inorganic Chemistry
University of Science and Technology of China, Hefei, China
Supervisor: Dr. Shu-Hong Yu

2002 - 2006 B.S. in Chemical Engineering, Hefei University, Hefei, China

Professional Appointments

2014 - Present Postdoctoral researcher (Supervisor: Dr. Yugang Sun)
Argonne National Laboratory
Center for Nanoscale Materials, Argonne, IL

2012 - 2014 Postdoctoral researcher (Supervisor: Dr. Yushan Yan)
University of Delaware
Department of Chemical and Biomolecular Engineering, Newark, DE

Research Interests

By combining materials science, catalysis, and electrochemistry, my research interests are focused on addressing the challenging scientific issues that occur in the field of energy conversion and storage (ECS). Based on the insights into materials science that governs the synthesis of novel nanostructures with controllable size, dimensionality, shape, and composition, as well as the in-depth understanding of critical electrochemical processes that involve in current ECS devices, I was committed to developing new electrocatalysts with optimal OER, HER, and ORR performances for electrolyzers and fuel cells applications by utilizing cheap and easily-prepared transition metal chalcogenides and corresponding hybrid materials. Currently, my interests also contain the hydrogenation and hydrodeoxygenation of bio-oil by electrochemical strategies with rationally designed electrocatalysts in view of the breakthrough in this field will afford our society with clean, safe, and sustainable energy supplies.

Awards and Honors

1. Excellent Doctoral Dissertation Award of **Chinese Academy of Sciences**, **2014**
2. Springer Theses Prize Nominated by USTC, **2014**
3. The Special Prize for the President Scholarship of **Chinese Academy of Sciences**, **2012**
4. Lu Jiaxi Excellent Graduate Student Award, **2012**
5. Academic Award for Doctoral Degree Candidates by **Chinese Ministry of Education, 2011**
6. Zhu Li Yue Hua Outstanding Graduate Student Scholarship, **2011**
7. Academic Award for Doctoral Degree Candidates by USTC, **2011**
8. The Best Oral Report Award from Doctoral Forum of China (Chemistry & Material), **2009**
9. Funding support from the Creative Scientific Research Foundation for graduate students of USTC, **2009**
10. Zhang Zong Zhi Science and Technology Award, **2009**

Publications

1. **M. R. Gao,** J. X. Liang, Y. R. Zheng, Y. F. Xu, J. Jiang, Q. Gao, J. Li, S. H. Yu* An Effective Molybdenum Disulfide/Cobalt Diselenide Hybrid Catalyst for Electrochemical Hydrogen Generation, ***Nature Communications*** 6, doi:10.1038/ncomms6982 (**2015**).
2. **M. R. Gao**, W. C. Sheng, Z. B. Zhuang, Q. R. Fang, S. Gu, J. Jiang, Y. S. Yan* Efficient Water Oxidation Using Alpha-Nickel-Hydroxide as an Electrocatalyst, ***Journal of the American Chemical Society*** 136(19), 7077-7084 **(2014)**.
3. **M. R. Gao,** Y. F. Xu, J. Jiang, S. H. Yu* Nanostructured Metal Chalcogenides: Synthesis, Modification, and Applications in Energy Conversion and Storage Devices, ***Chemical Society Reviews*** 42, 2986-3017 **(2013)**. **Invited Review**. **Top 15 most-read Chem Soc Rev reviews in 2013. ISI Highly Cited paper.**
4. **M. R. Gao,** Y. F. Xu, J. Jiang, Y. R. Zheng, S. H. Yu*. Water Oxidation Electrocatalyzed by an Efficient $Mn_3O_4/CoSe_2$ Nanocomposite, ***Journal of the American Chemical Society*** 134, 2930-2933 **(2012)**. **ISI Highly Cited paper.**
5. **M. R. Gao,** H. B. Yao, W. T. Yao, S. H. Yu*. Synthesis of Unique Ultrathin Lamellar Mesostructured $CoSe_2$ Nanobelts in a Binary Solution, ***Journal of the American Chemical Society*** 131, 7486-7487 **(2009)**.
6. **M. R. Gao,** Q. Gao, J. Jiang, C. H. Cui, W. T. Yao, S. H. Yu*. A Methanol-Tolerant Pt/$CoSe_2$ Nanobelt Cathode Catalyst for Direct Methanol Fuel Cells, ***Angewandte Chemie-International Edition*** 50, 4905-4908 **(2011)**.
7. Y. F. Xu,# **M. R. Gao,#** Y. R. Zheng, J. Jiang, S. H. Yu*. Nickel/Nickel(II) Oxide Nanoparticles Anchored onto Cobalt(IV) Diselenide Nanobelts for the Electrochemical Production of Hydrogen, ***Angewandte Chemie-International Edition*** 52, 8546-8550 (2013). Hot Paper & Frontispiece paper. # contributed equally.
8. **M. R. Gao,** X. Cao, Y. F. Xu, Q. Gao, Y. R. Zheng, J. Jiang, S. H. Yu* Nitrogen-Doped Reduced Graphene Supported $CoSe_2$ Nanobelt Composite Catalyst for Efficient Water Oxidation, ***ACS Nano***, 8(4), 3970-3978 **(2014)**.
9. **M. R. Gao,** S. R. Zhang, Y. F. Xu, J. Jiang, S. H. Yu*. Self-Assembled Platinum Nanochain Networks Driven by Induced Magnetic Dipoles, ***Advanced Functional Materials*** 24, 916-924 **(2014)**. **Back Cover.**
10. M. R. Gao, W. H. Xu, L. B. Luo, Y. J. Zhan, S. H. Yu*. Coaxial Metal Nano-/Microcables with Isolating Sheath: Synthetic Methodology and Their Application as Interconnects. *Advanced Materials* 22, 1977-1981 (2010). Research News. Special Issue of USTC.
11. **M. R. Gao,** J. Jinag, S. H. Yu*. Solution-Based Synthesis of Late Transition Metal Chalcogenides for Oxygen Reduction, ***Small*** 8, 13-27 **(2012)**. **Invited Review. Frontispiece Ppaer. Most Accessed Article.**
12. Y. R. Zheng,# **M. R. Gao,#** Q. Gao, H. H. Li, J. Xu, Z. Y. Xu, S. H. Yu* An Effective $CeO_2/CoSe_2$ Nanobelt Composite for Electrochemical Water Oxidation**,** ***Small*** **10, (2014) DOI: 10.1002/smll.201401423.** # contributed equally.
13. **M. R. Gao,** Z. Y. Lin, J. Jiang, H. B. Yao, Y. M. Lu, Q. Gao, S. H. Yu* Selective Synthesis of Fe_7Se_8 Polyhedra with Exposed High-Index Facets and Fe_7Se_8 Nanorods by Solvothermal Process in a Binary Solution and Their Collective Intrinsic Properties, ***Chemistry-A European Journal*** 17, 5068-5075 **(2011)**.
14. **M. R. Gao,** Z. Y. Lin, J. Jiang, C. H. Cui, Y. R. Zheng, S. H. Yu*. Completely Green Synthesis of Colloid Adams Catalyst α-PtO_2 Nanocrystals and Derivative Pt Nanocrystals with High Activity and Stability for Oxygen Reduction, ***Chemistry-A European Journal*** 18, 8423-8429 **(2012)**. **Inside Cover.**
15. **M. R. Gao,** S. R. Zhang, J. Jiang, Y. R. Zheng, D. Q. Tao, S. H. Yu*. One-Pot Synthesis of Hierarchical Magnetite Nanochain Assemblies with Complex Building Units and Their Application for Water Treatment, ***Journal of Materials Chemistry*** 21, 16888-16892 **(2011)**. **Back Cover.**

16. **M. R. Gao,** S. Liu, J. Jiang, C. H. Cui, W. T. Yao, S. H. Yu*. In Situ Controllable Synthesis of Magnetite Nanocrystals/$CoSe_2$ Hybrid Nanobelts and Their Enhanced Catalytic Performance, ***Journal of Materials Chemistry*** 20, 9355-9361 **(2010)**. **Hot Paper.**
17. **M. R. Gao,** Z. Y. Lin, T. T. Zhuang, J. Jiang, Y. F. Xu, Y. R. Zheng, S. H. Yu*. Mixed-Solution Synthesis of Sea Urchin-Like NiSe Nanofiber Assemblies as Economical Pt-Free Catalysts for Electrochemical H_2 Production, ***Journal of Materials Chemistry*** 22, 13662-13668 **(2012)**.
18. W. C. Sheng, Z. B. Zhuang, **M. R. Gao,** J. Zheng, J. G. Chen, Y. S. Yan* Correlating Hydrogen Oxidation/Evolution Reaction Activity on Platinum at Different pH with Measured Hydrogen Binding Energy, ***Nature Communications*** 6, doi:10.1038/ncomms6848 **(2015)**.
19. Y. J. Zhang*, **M. R. Gao**, K. D. Han, Z. Y. Fang, X. B. Yin, Z. Y. Xu. Synthesis, Characterization and Formation Mechanism of Dumbbell-Like $YOHCO_3$ and Rod-Like $Y_2(CO_3)_3{\cdot}2.5H_2O$, ***Journal of Alloys and Compounds*** 474, 598-604 **(2009)**.
20. Q. Gao, **M. R. Gao**, J. W. Liu, M. Y. Chen, C. H. Cui, H. H. Li, S. H. Yu* One-Pot Synthesis of Palladium Nanodendrities with Superior Electrocatalytic Performance, ***Nanoscale.*** 13, 3202-3207 **(2013)**. **Inside Front Cover.**
21. J. Jiang, **M. R. Gao**, Y. H. Qiu, G. S. Wang, G. B. Cai, L. Liu, S. H. Yu* Confined Crystallization of Polycrystalline High-Magnesium Calcite from Compact Mg-ACC Precursor Tablets and Its Biological Implications, ***CrystEngComm.*** 13, 952-956 **(2011)**.
22. J. Jiang, **M. R. Gao**, Y. H. Qiu, S. H. Yu* Gram-scale, Low-cost, Rapid Synthesis of Highly Stable Mg-ACC Nanoparticles and Their Long-term Preservation, ***Nanoscale.*** 2, 2358-2361 **(2010)**. **Cover.**
23. H. B. Yao, **M. R. Gao**, S. H. Yu*. Small Organic Molecule Templating Synthesis of Organic–inorganic Hybrid Materials: Their Nanostructures and Properties, ***Nanoscale.*** 2, 323-334 **(2010)**. **Invited Review.**
24. W. T. Yao, **M. R. Gao,** S. H. Yu*, J. F. Ding, X. G. Li. Self-Catalytic Synthesis of Hierarchical VN/C Superconducting Nanocomposites, ***RSC Advances*** 1, 1489-1492 **(2011)**.
25. S. L. Zhong, Y. Lu, **M. R. Gao**, S. J. Liu, J. Peng, L. C. Zhang, S. H. Yu*. Monodisperse mesocrystals of YF_3 and Ce^{3+}, Ln^{3+} (Ln = Tb^{3+}, Eu^{3+} and Sm^{3+}) co-activated YF_3: shape control synthesis and remarkable fluorescent properties, ***Chemistry-A European Journal*** 18, 5222-5231 **(2012)**. **VIP Paper.**
26. S. L. Yang, H. B. Yao, **M. R. Gao**, S. H. Yu*. Monodisperse Cubic Pyrite NiS_2 Dodecahedrons and Microspheres Synthesized by a Solvothermal Process in a Mixed Solvent: Thermal Stability and Magnetic Properties, ***CrystEngComm*** 11, 1383-1390 **(2009)**.
27. Y. Y. Liu, J. Jiang, **M. R. Gao**, B. Yu, L. B. Mao, S. H. Yu*. Phase Transformation of Magnesium Amorphous Calcium Carbonate (Mg-ACC) in a Binary Solution of Ethanol and Water, ***Crystal Growth & Design*** 13, 59-65 **(2013)**.
28. C. H. Cui, H. H. Li, J. W. Yu, **M. R. Gao**, S. H. Yu* Ternary Heterostructured Nanoparticle Tubes: A Dual Catalyst and Its Synergistic Enhancement Effects for O_2/H_2O_2 Reduction, ***Angewandte Chemie-International Edition*** 49, 9149-9152 **(2010)**.
29. C. H. Cui, J. W. Yu, H. H. Li, **M. R. Gao**, H. W. Liang, S. H. Yu* Remarkable Enhancement of Electrocatalytic Activity by Tuning the Interface of Pd-Au Bimetallic Nanoparticle Tubes, ***ACS Nano*** 5, 4211-4218 **(2011)**.
30. P. Chen*, L. K. Wang, G. Wang, **M. R. Gao,** J. Ge, W. J. Yuan, Y. H. Shen, S. H. Yu* Nitrogen-Doped Nanoporous Carbon Nanosheets Derived From Plant Biomass: An Effective Catalyst for Oxygen Reduction Reaction, ***Energy & Environmental Science*** 7, 4095-4103 **(2014)**.
31. C. H. Cui, X. J. Liu, H. H. Li, **M. R. Gao**, H. W. Liang, H. B. Yao, S. H. Yu* Ternary PtPdCu Electrocatalyst Formed Through Surface Atomic Redistribution Against Leaching, ***ChemCatChem*** 4, 1560-1563 **(2012)**.
32. C. H. Cui, H. H. Li, X. J. Liu, **M. R. Gao**, S. H. Yu* Surface Composition and Lattice Ordering Controlled Activity and Durability of CuPt Electrocatalysts for Oxygen Reduction Reaction, ***ACS Catalysis*** 2, 916-924 **(2012)**.

33. Q. Gao, Y. M. Ju, D. An, **M. R. Gao,** J. W. Liu, C. H. Cui, S. H. Yu*, Shape-Controlled Synthesis of Monodisperse PdCu Nanocubes and Their Electrocatalytic Properties, ***ChemSusChem*** 6, 1878-1882 **(2013)**.
34. H. H. Li, C. H. Cui, S. Zhao, H. B. Yao, **M. R. Gao,** F. J. Fan, S. H. Yu*. Mixed-PtPd-Shell PtPdCu Nanoparticle Nanotube Templated from Copper Nanowires as Efficient and High Durable Electrocatalysts, ***Advanced Energy Materials*** 2, 1182-1187 **(2012)**. **Cover.**
35. Y. X. Zhou, H. B. Yao, Y. Wang, H. L. Liu, **M. R. Gao**, P. K. Shen, S. H. Yu*. Hierarchical Hollow Co_9S_8 Microspheres: Solvothermal Synthesis, and Their Magnetic, Electrochemical and Electrocatalytic Properties. ***Chemistry-A European Journal*** 16, 12000-12007 **(2010)**.
36. G. Q. He, Z. X. Yan, M. Cai, P. K. Shen*, **M. R. Gao,** H. B. Yao, S. H. Yu*. Ionic Exchange Assisted Synthesis of Pt-VC Nanoparticles Loaded on Graphitized Carbon (Pt-VC/GC): A High Performance Nanocomposite Electrocatalyst for Oxygen Reduction Reaction, ***Chemistry-A European Journal*** 18, 8490-8497 **(2012)**.
37. **M. R. Gao,** Maria K. Y. Chan, Y. G. Sun* Edge-Oriented Molybdenum Disulfide with with a 9.4 Å interlayer spacing for electrochemical hydrogen production, Submitted to ***Nat. Commun.*** 2015, Under review.
38. **M. R. Gao**, Y. F. Xu, J. Jiang, S. H. Yu*. Engineering and Optimizing One-Dimensional Nanostructures of 3*d* Metal Chalcogenides for Enhanced Electrocatalysis, Submitted to ***Acc. Chem. Res.*** 2015, **Invited**. Under review.

Book Chapters

1. **M. R. Gao**, J. Jiang, Q. Gao, S. H. Yu*. Chalcogenide Semiconductor Based Core/Shell Nanostructures: Synthesis, Properties and Application, **Encyclopedia of Semiconductor Nanotechnology**, Edited by Ahmad Umar, American Scientific Publishers, USA, **2011**.
2. J. Jiang, **M. R. Gao**, Y. F. Xu, S. H. Yu*. Amorphous Cacium Carbonate: Synthesis and Transformation, **Bioinspiration: From Understanding to Fabrication**, Edited by Xiangyang Liu, Spinger, **2011**.

Presentations at Conferences

1. "Water Oxidation Using Alpha-Nickel-Hydroxide as an Electrocatalyst" The 224th ECS Meeting, San Francisco, CA, **Oral Presentation**, (2013).
2. "Design And Synthesis of Several Kinds of Transition Metal Selenides and Their Hybrid Materials for Oxygen Reduction Reaction" The 6th PhD Student Workshop of USTC-CityU, Hefei, Anhui, **Oral Presentation**, (2012)
3. "Cobalt Diselenide as Efficient Oxygen Evolution Electrocatalyst" The 1st Annual Academic Conference of USTC, Hefei, Anhui, **Oral Presentation**, (2011)
4. "Design of Low/Non-Platinum Nanocatalysts for Oxygen Reduction Reaction" Doctoral Forum of China (Chemistry & Material), Nanjing University, **Oral Presentation**, (2009)
5. "Synthesis of Unique Lamellar Mesostructured $CoSe_2$-Amine (Protonated) Nanobelts in a Binary Solution" The 13th Asian Chemical Congress, Chinese Chemical Society, Shanghai, **Poster**, (2009)

Membership in Professional Societies

The Electrochemical Society

Reviewer for Journals

Advanced Materials
Small