

Zengcai Liu

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Chemical Functionality Group
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Education

Nanjing Institute of Chemical Technology, China	Applied Chemistry	B.E., 1994
Beijing University of Chemical Technology, China	Applied Chemistry	M.E., 1997
Nanyang Technological University, Singapore	Electrochemistry	Ph.D., 2007

Research Synopsis

The research focuses on (1) the synthesis and characterization electrode materials and electrolytes for lithium ion and lithium sulfur batteries; (2) the modification of polymer electrolyte for direct methanol fuel cells; (3) synthesis and characterization of electrocatalysts for fuel cells, (4) corrosion mechanism and protection strategies for various materials and devices.

Professional Experience

2010–p Postdoctoral Research Associate, Chemical Functionality Group, Center for Nanophase Materials Sciences, Oak Ridge National Laboratory
2006–2010 Postdoctoral Fellow, Chemical and Biomolecular Engineering, University of Houston, Texas
2002–2006 Research Assistant, Nanyang Technological University, Singapore
2000–2002 Director, Senior Engineer, Beijing LN Power Sources, Ltd., Co., China
1997–2000 Engineer, General Research Institute for Nonferrous Materials, Beijing, China
1994–1997 Research Assistant, Beijing University of Chemical Technology, China

Professional and Synergistic Activities

2009–p Proposal Reviewer, ACS Petroleum Research Fund
2009–p Reviewer, *Advanced Scientific Letters*; *Applied Physics*; *Electrochemistry Communications*; *Electrochimica Acta*; *International Journal of Hydrogen Energy*; *Journal of the Electrochemical Society*; *Journal of Power Sources*
2007–p Member, Electrochemical Society
2007 Session Chair, 6th International Conference on Materials Processing, Properties and Performances (MP³), Beijing, China

Honors and Awards

2008 1st Place, Poster Competition, 2008 Gordon Research Conference on Fuel Cells
2002–2006 Graduate Fellowship, Nanyang Technological University, Singapore
2002 Top 100 Youth Academic Leader, Beijing Mechanical and Electrical Research Institute, China
2001 3rd Place, Technological Invention, China Petroleum and Chemical Industry Federation Progress
1999 3rd Place, Science & Technology Progress, Nonferrous Metal Industry Bureau of China
1997 Outstanding Graduate Student Award, Beijing University of Chemical Technology
1994 Outstanding Graduate Student Award, Nanjing Institute of Chemical Technology, Nanjing, China
1990–1994 1st and 2nd Class Scholarship, Nanjing Institute of Chemical Technology

Patents

C. Liang, Z. Liu, W. Fu, Z. Lin, N. J. Dudney, J. Y. Howe, and A. J. Rondinone, "Lithium Sulfide Compositions for Battery Electrolyte and Battery Electrode Coatings," U.S. Patent Applic. No. 13/463,451, May 3, 2012.

Recent Invited Talks and Contributed Conference Presentations

"Li₂S-P₂S₅ Solid Electrolytes for Lithium-Ion and Lithium Sulfur Batteries," *ECS 220th Meeting*, Boston, MA, Oct. 9-14, 2011.

"Corrosion Inhibitor for Use in Giant Magnetoresistance (GMR) Biosensors," *ECS 218th Meeting*, Las Vegas, NV, Oct. 10-15, 2010.

"Dealloyed PtM₃(M= Fe, Co, Ni, ...) Electrocatalysts for Oxygen Reduction Reaction," *ECS 215th Meeting*, San Francisco, CA, May 24-29, 2009.

"Phase Stabilized and Enhanced PtCu₃/C Oxygen Reduction Electrocatalysts via Au Galvanic Displacement," *2008 Gordon Research Conferences on Fuel Cells*, Bryant University, Smithfield, RI, Jul. 20-25, 2008.

Publications (Over 30 publications in refereed journals, citation > 460, 1 book chapter) *Full Listing Follows CV*

Graduate and Postdoctoral Advisors:

Postdoctoral Advisors:	Dr. Chengdu Liang (Oak Ridge National Laboratory)
	Dr. Peter Strasser (University of Houston, Texas, <i>current affiliation</i> , Technical University Berlin, Germany)
Ph.D. Advisor:	Dr. San Ping Jiang (Nanyang Technological University, Singapore, <i>current affiliation</i> , Curtin University, Australia)
Graduate Advisor:	Dr. Yuzhen Lin (Beijing University of Chemical Technology, <i>retired</i>)

PUBLICATIONS

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Book Chapter

Z. Liu, W. Fu, C. Liang, "Lithium Sulfur Batteries," Chapter 24 in *Handbook of Battery Materials*, 2nd Edition, Vol. 1, Eds., C. Daniel and J. O. Besenhard, Wiley-VCH, Hoboken, NJ (2011).

Peer-Reviewed Publications

- Z. C. Liu, H. H. Zhen, Y. Kim, C. D. Liang, "Synthesis of LiNiO₂ Cathode Materials with Homogeneous Al Doping at the Atomic Level," *Journal of Power Sources* **196**(23), 10201-10206 (2011).
- Z. Liu, Y.-J Wang, J. Litvinov, P. Chinwangso, R. Willson, D. Litvinov, "Corrosion Inhibitor for Use in Giant Magnetoresistance (GMR) Biosensors," *ECS Transactions* **33**, 103-111 (2011).
- P. Strasser, S. Koh, T. Anniyev, J. Greeley, K. More, C. Yu, Z. Liu, S. Kaya, D. Nordlund, H. Ogasawara, M. F. Toney, A. Nilsson, "Lattice-Strain Control of the Activity in Dealloyed Core-shell Fuel Cell Catalysts," *Nature Chemistry* **2**(6), 454-460 (2010).
- R. Forgie, G. Bugosh, K. C. Neyerlin, Z. Liu, P. Strasser, "Bimetallic Ru Electrocatalysts for the OER and Electrolytic Water Splitting in Acidic Media," *Electrochemical and Solid State Letters* **13**(4), D36-D39 (2010).
- K.C. Neyerlin, G. Bugosh, R. Forgie, Z. Liu, P. Strasser, "Combinatorial Study of High Surface-Area Binary and Ternary Electrocatalysts for the Oxygen Evolution Reaction," *Journal of the Electrochemical Society* **156**(3), B363-B369 (2009).
- P. Strasser, Z. Liu, S. Koh, "Aging Studies of Voltammetrically Dealloyed Pt-Cu Nanoparticle ORR Electrocatalysts," *ECS Transactions* **17**(2), 515-522 (2008).
- Z. C. Liu, C. F. Yu, I. A. Rusakova, D. X. Huang, P. Strasser, "Synthesis of Pt₃Co Alloy Nanocatalyst via Reverse Micelle for Oxygen Reduction Reaction in PEMFCs," *Topics in Catalysis* **49**(3-4), 241-250 (2008).
- Z. C. Liu, S. Koh, C. F. Yu, P. Strasser, "Synthesis, De-alloying, and ORR Electrocatalysis of PDDA-Stabilized Cu-Rich Pt Alloy Nanoparticles," *Journal of the Electrochemical Society* **154**(11), B1192-B1199 (2007).
- Z. Q. Tian, S. P. Jiang, Z. C. Liu, L. Li, "Polyelectrolyte-stabilized Pt Nanoparticles as New Electrocatalysts for Low Temperature Fuel Cells," *Electrochemistry Communications* **9**(7), 1613-1618 (2007).
- S. P. Jiang, Z. C. Liu, Z. Q. Tian, "Layer-by-Layer Self-Assembly of Composite Polyelectrolyte-Nafion Membrane for Direct Methanol Fuel Cells," *Advanced Materials* **18**(8), 1068-1072 (2006).
- S. P. Jiang, Z. C. Liu, H. Tang, M. Pan, "Synthesis and Characterization of PDDA-Stabilized Pt Nanoparticles for Direct Methanol Fuel Cells," *Electrochimica Acta* **51**(26), 5721-5730 (2006).
- Z. C. Liu, Z. Q. Tian, S. P. Jiang, "Synthesis and Characterization of Nafion-Stabilized Pt Nanoparticles for Polymer Electrolyte Fuel," *Electrochimica Acta* **52**(3), 1213-1220 (2006).
- Z. C. Liu, S. P. Jiang, "Synthesis of PDDA-Pt Nanoparticles for the Self-Assembly of Electrode/Nafion Membrane Interface of Polymer Electrolyte Fuel Cells," *Journal of Power Sources* **159**(1), 55-58 (2006).
- S. P. Jiang, L. Li, Z. C. Liu, M. Pan, H. L. Tang, "Self-Assembly of PDDA-Pt Nanoparticle/Nafion Membranes for Direct Methanol Fuel Cells," *Electrochemical Solid State Letters* **8**(11), A574-A576 (2005).
- M. Pan, H. Tang, S. P. Jiang, Z. Liu, "Fabrication and Performance of Polymer Electrolyte Fuel Cells by Self-Assembly of Pt Nanoparticles," *Journal of the Electrochemical Society* **152**(6), A1081-A1088 (2005).

- M. Pan, H. L. Tang, S. P. Jiang, Z. C. Liu, "Self-Assembled Membrane-Electrode-Assembly of Polymer Electrolyte Fuel Cells," *Electrochemistry Communications* **7**(2), 119-124 (2005).
- H. L. Tang, Z. P. Luo, M. Pan, S. P. Jiang, Z. C. Liu, "Synthesis of Platinum Nanoparticles and Then Self-Assembly on Nafion Membrane To Give A Catalyst Coated Membrane," *Journal of Chemical Research-S* **7** 449-451 (2005).
- Y. Lin, Z. Liu, X. Yong, H. Li, "R & D and Application of Aluminium-Silicon Allied Corrosion Inhibitor," *Fine and Specialty Chemicals* **9**, 24-26 (2001). ***In Chinese**
- L. Y. Lin, Z. C. Liu, Y. H. Zhao, J. Xu, "Study on Marine Corrosion and Antifouling Behavior of Copper Alloys Exposed to Sea Areas in China," *Rare Metals* **19**(2), 96-100 (2000).
- Z. Liu, L. Lin, J. Xu, Y. Zhao, "Diffusion Mechanism of Dezincification in Double Phase Brass Exposed to Seawater," *Chinese Journal of Materials Research* **14**, 145-149 (2000). ***In Chinese**
- Y. Zhao, L. Lin, Z. Liu, J. Xu, "Influence of Microstructure Inhomogeneity on Corrosion of Aluminum Sacrificial Anodes," *Chinese Journal of Rare Metals* **24**(5), 341-344 (2000). ***In Chinese**
- Z. Liu, L. Lin, J. Xu, Y. Zhao, "Characteristics of Original Surface Film of Brass HSn70-1A and Its Corrosion Behavior in Seawater," *Chinese Journal of Rare Metals* **24**(6) 466-469 (2000). ***In Chinese**
- J. Xu, L. Y. Lin, Z. C. Liu, Y. H. Zhao, "Designation and Application of a Photographic Database for Nonferrous Metals Exposed to Seawater," *Rare Metal Materials and Engineering* **29**(4), 285-287 (2000). ***In Chinese**
- L. Lin, Z. Liu, J. Xu, Y. Zhao, "Abnormal Corrosion Behavior of Al-Mg and Al-Mn Alloy in Seawater," *Corrosion Science and Protection Technology* **12**(4), 198 (2000) ***In Chinese**
- L. Lin, S. Liu, Z. Liu, J. Xu, "Surface and Interface Characteristics of Cu-Ni Alloy Corroded in Seawater," *Corrosion Science and Protection Technology* **11**(1), 43 (1999) ***In Chinese**
- Z. Liu, L. Lin, S. Liu, "Dezincification Corrosion Behavior and Its Inhibiting Mechanism of Brass Exposed to Seawater," *Corrosion Science and Protection Technology* **11**(2), 81-83 (1999). ***In Chinese**
- Z. C. Liu, L. Y. Lin, S. F. Liu, Y. H. Zhao, "Diffusion Mechanism of Dezincification in Double-Phase Brass Exposed to Seawater," *Transactions of Nonferrous Metals Society of China* **9**(3), 572-577 (1999). ***In Chinese**
- Z. C. Liu, L. Y. Lin, J. Xu, "Study of Dezincification Corrosion Behavior of Brass Exposed to Seawater and Its Inhibition Mechanism" *Rare Metals* **18**(4), 241-247 (1999). ***In Chinese**

Conference Proceedings

- Z. Liu, D. Huang, S. Koh, C. Yu, K. L. More, L. F. Allard, Jr., P. Strasser, "Phase Stabilized and Enhanced PtCu₃/C Oxygen Reduction Electrocatalysts via Au Galvanic Displacement," Ch. 5 in *Energy Storage, Fuel Cells and Hydrogen, Technical Proc. of Clean Technology Conference and Expo 2009*, Houston, TX, May 3-7, 2009, Eds. M. Laudon, D. L. Laird, and B. Romanowicz, Taylor & Francis Group: New York, New York, 2009.