

Guangsheng Zhang

Department of Mechanical & Aerospace Engineering
The University of Alabama in Huntsville
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PROFESSIONAL PREPARATION

Postdoctoral Researcher, Mechanical Engineering, The Pennsylvania State University, 2011-2013

Postdoctoral Researcher, Mechanical Engineering, Rochester Institute of Technology, 2010-2011

Ph.D., Power Engineering and Engineering Thermophysics, Xi'an Jiaotong University, China, 2010

B.S., Thermal Energy and Power Engineering, Xi'an Jiaotong University, China, 2003

B.A., English (Minor Diploma Program), Xi'an Jiaotong University, China, 2003

APPOINTMENTS

Assistant Professor, Department of Mechanical & Aerospace Engineering, The University of Alabama in Huntsville, 08/2017 - Present

Research Associate, Department of Mechanical & Nuclear Engineering, The Pennsylvania State University, University Park, PA, 08/2013 - 07/2017

TEACHING

[3] MAE 450, Intro to Heat & Mass Transfer, University of Alabama in Huntsville, Spring 2019 - Present

[2] MAE 451, Heat & Mass Transfer Lab, University of Alabama in Huntsville, Fall 2019 - present

[1] MAE 341, Thermodynamics I, University of Alabama in Huntsville: Fall 2017, Spring 2018, Fall 2018

RESEARCH PUBLICATIONS

Journal Papers

[31] S. Huang*, X. Du**, M. Richter**, J. Ford**, G. M. Cavalheiro*, Z. Du, R. T. White, and **G. Zhang**. Understanding Li-ion Cell Internal Short Circuit and Thermal Runaway through Small, Slow and In Situ Sensing Nail Penetration, *Journal of The Electrochemical Society*, 2020, **167**, 090526 (*graduate student at UAH, ** undergraduate student at UAH)

[30] G. M. Cavalheiro*, T. Iriyama**, G. J. Nelson, S. Huang*, and **G. Zhang**. Effects of Nonuniform Temperature Distribution on Degradation of Lithium-Ion Batteries. *Journal of Electrochemical Energy Conversion and Storage*, 2019, 17(2), 021001 (*graduate student at UAH, **undergraduate student at UAH)

[29] S. Huang*, X. Wu, G. M. Cavalheiro*, X. Du**, B. Liu, Z. Du, and **G. Zhang**. In situ measurement of lithium-ion cell internal temperatures during extreme fast

- charging, *Journal of The Electrochemical Society*, 2019, 166: A3254-A3259 (*graduate student at UAH, **undergraduate student at UAH)
- [28] X.G. Yang, **G. Zhang**, S. Ge, C.Y. Wang. Fast charging of lithium-ion batteries at all temperatures, *Proceedings of the National Academy of Sciences*, 2018, 115 (28): 7266–7271
- [27] **G. Zhang**, H. Tian, S. Ge, D. Marple, F. Sun, C.Y. Wang. Visualization of self-heating of an all climate battery by infrared thermography, *Journal of Power Sources*, 2018, 376: 111-116
- [26] **G. Zhang**, S. Ge, X.G. Yang, Y. Leng, D. Marple, C.Y. Wang. Rapid restoration of electric vehicle battery performance while driving at low temperatures, *Journal of Power Sources*, 2017, 371: 35-40
- [25] X.G. Yang, Y. Leng, **G. Zhang**, S. Ge, C.Y. Wang. Modeling of lithium plating induced aging of lithium-ion batteries: Transition from linear to nonlinear aging, *Journal of Power Sources*, 2017, 360: 28-40
- [24] C.Y. Wang, **G. Zhang**, S. Ge, T. Xu, Y. Ji, X.G. Yang, Y.J. Leng. Lithium-ion battery structure that self-heats at low temperatures, *Nature*, 2016, 529: 515-518
- [23] **G. Zhang**, S. Ge, T. Xu, X. G. Yang, H. Tian, C. Y. Wang. Rapid self-heating and internal temperature sensing of lithium-ion batteries at low temperatures. *Electrochimica Acta*, 2016, 218: 149-155
- [22] X. G. Yang, **G. Zhang**, C. Y. Wang. Computational design and refinement of self-heating lithium-ion batteries. *Journal of Power Sources*, 2016, 328: 203-211
- [21] C. Y. Wang, T. Xu, S. Ge, **G. Zhang**, X. G. Yang, Y. Ji. A Fast Rechargeable Lithium-Ion Battery at Subfreezing Temperatures. *Journal of The Electrochemical Society*, 2016, 163(9): A1944-A1950
- [20] G.Y. Chen, **G. Zhang**, L.J. Guo, H.T. Liu. Systematic study on the functions and mechanisms of micro porous layer on water transport in proton exchange membrane fuel cells. *International Journal of Hydrogen Energy*, 2016, 41(9): 5063–5073
- [19] **G. Zhang**, L. Cao, S. Ge, C. Y. Wang, C. E. Shaffer, C. D. Rahn. Reaction temperature sensing (RTS)-based control for Li-ion battery safety, *Scientific Reports*, 2015, 5: 18237
- [18] **G. Zhang**, L. Cao, S. Ge, C.Y. Wang, C. E. Shaffer, C. D. Rahn. In situ measurement of radial temperature distributions in cylindrical Li-ion cells, *Journal of The Electrochemical Society*, 2014, 161: A1499-A1507
- [17] **G. Zhang**, C. E. Shaffer, C.Y. Wang, C. D. Rahn. Effects of non-uniform current distribution on energy density of Li-ion cells, *Journal of The Electrochemical Society*, 2013, 160: A2299-A2305
- [16] **G. Zhang**, C. E. Shaffer, C.Y. Wang, C. D. Rahn. In-situ measurement of current distribution in a Li-ion cell, *Journal of The Electrochemical Society*, 2013, 160: A610-A615
- [15] **G. Zhang**, S. G. Kandlikar. A critical review of cooling techniques in proton exchange membrane fuel cell stacks. *International Journal of Hydrogen Energy*, 2012, 37(3): 2412-2429
- [14] **G. Zhang**, S.L. Shen, L.J. Guo, H.T. Liu. Dynamic characteristics of local current densities and temperatures in proton exchange membrane fuel cell during reactant starvations. *International Journal of Hydrogen Energy*, 2012, 37(2):

- 1884-1892
- [13] Z.J. Lu, C. Rath, **G. Zhang**, S. G. Kandlikar. Water management studies in PEM fuel cells, Part IV: Effects of channel surface wettability, geometry and orientation on the two-phase flow in parallel gas channels. *International Journal of Hydrogen Energy*, 2011, 36(16): 9864-9875
 - [12] **G. Zhang**, L.J. Guo, L.Z. Ma, H.T. Liu. Simultaneous measurement of current and temperature distributions in a proton exchange membrane fuel cell. *Journal of Power Sources*, 2010, 195(11): 3597-3604
 - [11] C.J. Xu, **G. Zhang**, L.J. Guo, H.T. Liu. Modeling of water transport in PEM fuel cells. *Journal of Engineering Thermophysics*, 2010, 31(9): 1505-1508
 - [10] **G. Zhang**, L.J. Guo, B. Ma, H.T. Liu. Comparison of current distributions in proton exchange membrane fuel cells with interdigitated and serpentine flow fields. *Journal of Power Sources*, 2009, 188(1): 213-219
 - [9] H. Sun, **G. Zhang**, L.J. Guo, H.T. Liu. A study of dynamic characteristics of PEM fuel cells by measuring local currents. *International Journal of Hydrogen Energy*, 2009, 34(13): 5529-5536
 - [8] D.H. Shang, B. Ma, **G. Zhang**, L.J. Guo, H.T. Liu. Analysis of impedance with different discharge current in proton exchange membrane fuel cell, *Journal of Xi'an Jiaotong University*, 2008, 42(5): 622-625
 - [7] H. Sun, **G. Zhang**, L.J. Guo, D.H. Shang, H.T. Liu. Effects of humidification temperatures on local current characteristics in a PEM fuel cell, *Journal of Power Sources*, 2007, 168: 400-407
 - [6] H. Sun, **G. Zhang**, L.J. Guo, H.T. Liu. A novel method of measuring current distribution in PEM fuel cells, *Journal of Power Sources*, 2006, 158(1): 326-332
 - [5] D.H. Shang, **G. Zhang**, L.J. Guo. Effects of reactant gas flow rates on the current distribution in a PEM fuel cell, *Journal of Wuhan University of Technology*, 2006, 28 (s2): 601-604
 - [4] H. Sun, L.J. Guo, H.T. Liu, **G. Zhang**. Two-phase mass transport in PEM fuel cell and its effects, *Journal of Engineering Thermophysics*, 2006, 27(2): 262-264
 - [3] H. Sun, L.J. Guo, H.T. Liu, **G. Zhang**. Effects of operating parameters on mass transport of water in PEM fuel cell, *Journal of Engineering Thermophysics*, 2005, 26(2): 257-260
 - [2] H. Sun, L.J. Guo, H.T. Liu, **G. Zhang**. Transport characteristics of water and proton in the membrane of PEM fuel cells, *Journal of Chemical Industry and Engineering*, 2005, 56(6): 1081-1085
 - [1] H. Sun, L.J. Guo, H.T. Liu, **G. Zhang**. Two-phase transport of water in porous medium of proton exchange membrane fuel cells, *Journal of Xi'an Jiaotong University*, 2005, 39(11): 1177-1181

Conference Papers/Abstracts

- [30] S. Huang*, X. Wu, G. M. Cavaleiro*, X. Du**, B. Liu, Z. Du, and **G. Zhang**. Characterizing Li-Ion Battery Extreme Fast Charging through in Situ Measurement of Temperature Distributions, 236th ECS Meeting, October 13 - 17, 2019, Atlanta, GA (*graduate student, **undergraduate student) (**Invited**)
- [29] S. Huang*, and **G. Zhang**. In-situ Diagnosis of Li-Ion Battery Internal Short Circuit, ASME InterPACK 2019 Conference, Anaheim, CA, Oct. 7-9, 2019 (*graduate student, **undergraduate student)

- [28] G. M. Cavalheiro**, T. Iriyama*, G. J. Nelson, S. Huang*, and **G. Zhang**. Effects of Non-Uniform Temperature Distributions on Lithium-Ion Battery Degradation, ASME InterPACK 2019 Conference, Anaheim, CA, Oct. 7-9, 2019 (*graduate student, **undergraduate student)
- [27] S. Huang*, X. Du**, G. M. Cavalheiro*, M. Richter**, T. Iriyama**, **G. Zhang**. Single-Layer Nail Penetration for Lithium-Ion Battery Safety Characterization, 235th ECS Meeting, May 26 - 30, 2019, Dallas, TX (*graduate student, **undergraduate student)
- [26] S. Huang*, X. Du**, G. M. Cavalheiro*, M. Richter**, T. Iriyama**, **G. Zhang**. Characterizing Lithium-ion Battery Internal Short Circuit with Slow-penetrating Micro Sensing Nails, *2018 NASA Aerospace Battery Workshop*, Huntsville, AL, November 27- 29, 2018 (*graduate student, **undergraduate student)
- [25] S. Huang*, X. Du**, G. M. Cavalheiro*, M. Richter**, T. Iriyama**, **G. Zhang**. In Situ Measurement of Temperatures in Li-ion Cells under Extreme Conditions, *Americas International Meeting on Electrochemistry and Solid State Science (AiMES 2018)*, September 30 - October 4, 2018, Cancun, Mexico (*graduate student, **undergraduate student) (**Invited**)
- [24] **G. Zhang**, Effects of Non-Uniform Temperature Distribution on Degradation of Lithium-Ion Cells, *233rd ECS Meeting*, Seattle, WA, May 13-17, 2018
- [23] **G. Zhang**, Internal temperature sensing and thermal management of large-format Li-ion cells, *2017 NASA Aerospace Battery Workshop*, Huntsville, AL, November 14-16, 2017
- [22] **G. Zhang**, S. Ge, Y. Leng, X. G. Yang, D. Marple, C. Y. Wang. Robust internal temperature sensing of large-format Li-ion cells, *231st ECS Meeting*, New Orleans, LA, USA, May 28-June 1, 2017 (**Invited**)
- [21] **G. Zhang**, S. Ge, T. Xu, C. Y. Wang. In situ diagnosis and control of Li-ion batteries for enhanced safety, *228th ECS Meeting*, Phoenix, AZ, USA, Oct. 11 - 15, 2015
- [20] C. Y. Wang, **G. Zhang**, S. Ge, T. Xu, Y. Ji, and X. G. Yang. Fast charging of Li-ion batteries in extreme cold, *228th ECS Meeting*, Phoenix, AZ, USA, Oct. 11 - 15, 2015
- [19] **G. Zhang**, L. Cao, S. Ge, C. Y. Wang, C. E. Shaffer, C. D. Rahn. Enhancing safety of Li-ion battery for electric vehicles through in situ diagnosis, *14th International Conference on Clean Energy (ICCE 2015)*, Saskatoon, SK, Canada, Sep. 27- Oct. 1, 2015
- [18] **G. Zhang**, L. Cao, S. Ge, C. Y. Wang, C. E. Shaffer, C. D. Rahn. In situ measurement of temperature distribution in cylindrical Li-ion cells, *2014 ECS and SMEQ Joint International Meeting*, Cancun, Mexico, Oct. 5-10, 2014
- [17] C. Y. Wang, **G. Zhang**, C. E. Shaffer and Puneet K. Sinha. Delivering 10x improvement in Li-ion battery power and energy at -30 °C through active control, *MRS Spring Meeting & Exhibit*, San Francisco, USA, Apr. 21-25, 2014
- [16] **G. Zhang**, L. Cao, S. Ge, C. Y. Wang, C. E. Shaffer, C. D. Rahn, In situ measurement of li-ion battery internal temperature, *224th ECS Meeting*, Abstract #538, San Francisco, USA, Oct. 27 - Nov. 01, 2013
- [15] J. P. Owejan, W. Gu, J. Gagliardo, P. Nicotera, A. Kongkanand, R. Reid, M. Mench, J. LaManna, S. Chakraborty, F. Zhang, M. Hickner, S. Petrina, S. G.

- Kandlikar, T. Trabold, **G. Zhang**, J. Sergi, M. Daino. Validation and characterization database supporting two-phase 1+1D PEMFC model development, *220th ECS Meeting*, Boston, USA, Oct. 9-14, 2011
- [14] **G. Zhang**, S.L. Shen, H.T. Liu, L.J. Guo. Study of reactants starvation in PEM fuel cell via dynamic measurement of local currents and temperatures, *10th Int. Conf. on Clean Energy (ICCE-2010)*, Gazimagusa, N. Cyprus, Sep. 15-17, 2010
- [13] H. Sun, **G. Zhang**, L.J. Guo. Transient Characteristics of PEMFC based on Fuel Cell Temperature, *Power and Energy Engineering Conference (APPEEC), 2010 Asia-Pacific, Chengdu, China*, Mar. 28-31, 2010
- [12] **G. Zhang**, L.J. Guo, L.Z. Ma, S.L. Shen, H.T. Liu. Simultaneous measurement of current and temperature distributions in PEM fuel cell. *China-North America Workshop on Fuel Cell*, Shanghai, China, Aug. 13-15, 2009
- [11] L.J. Guo, **G. Zhang**, C.J. Xu, L.Z. Ma, S.L. Shen, H.T. Liu, Y. Yang and H. Sun, Study of thermal management in PEM fuel cells with numerical modeling and *in-situ* diagnosis approaches, *Int. Symp. on Convective Heat and Mass Transfer in Sustainable Energy (CONV-09)*, Hammamet, Tunisia, Apr. 26 - May 1, 2009 (Plenary)
- [10] H. Sun, **G. Zhang**, H.T. Liu, L.J. Guo. Dynamic local current characteristics of PEM fuel cells to humidification temperature. *6th Int. Symp. on Multiphase Flow, Heat Mass Transfer & Energy Conversion*, Xi'an, China, Jul. 11-15, 2009
- [9] B. Ma, **G. Zhang**, H.T. Liu, L.J. Guo. Characterization of a H₂/air PEMFC with different flow fields by electrochemical impedance spectroscopy. *International Hydrogen Forum (HyForum)*, Changsha, China, Aug. 3-6, 2008
- [8] **G. Zhang**, B. Ma, D.H. Shang, L.J. Guo, H. Sun, H.T. Liu. Measurement of current distributions in a PEM fuel cell with interdigitated flow fields. *ECS Transactions*, 2007, 11(1): 1545-1552
- [7] **G. Zhang**, B. Ma, C.J. Xu, H.T. Liu, L.J. Guo, D.H. Shang, C.M. Zhang, H.T. Liu. Current distributions in a PEM fuel cell with interdigitated flow fields. *8th Chinese Hydrogen Energy Conference*, Xi'an, China, Oct. 12-14, 2007
- [6] **G. Zhang**, H. Sun, L.J. Guo, D.H. Shang, H.T. Liu. Study of a PEMFC performance based on a novel current distribution measurement method, *16th World Hydrogen Energy Conference*, Lyon, France, Jun. 13-16, 2006
- [5] H. Sun, **G. Zhang**, L.J. Guo, H.T. Liu, D.H. Shang. A novel method to measuring current distribution in PEM fuel cells, *2005 Fuel Cell Seminar*, Palm Springs, CA, USA, Nov. 14-18, 2005
- [4] H. Sun, H.T. Liu, J. Ji, **G. Zhang**, L.J. Guo. Water transport in porous media of PEM fuel cells, *5th Int. Symp. on Multiphase Flow, Heat Mass Transfer and Energy Conversion*, Xi'an, China, Jul. 3-6, 2005
- [3] H. Sun, **G. Zhang**, D.H. Shang, L.J. Guo, H.T. Liu. Experimental study on the effects of humidification temperature on current distribution in PEM fuel cells. *6th Chinese Hydrogen Energy Conference*, Shanghai, China, Nov. 18-21, 2005
- [2] L.J. Guo, H. Sun, **G. Zhang**, H.T. Liu. Research on the measurement method for current distribution in single fuel cell and stack. *6th Chinese Hydrogen Energy Conference*, Shanghai, China, Nov. 18-21, 2005
- [1] **G. Zhang**, L.J. Guo, H. Sun, D.H. Shang, C.M. Zhang, H.T. Liu. Effects of operating parameters on the performance of PEM fuel cells. *5th Chinese*

Hydrogen Energy Conference, Beijing, China, Oct. 20-22, 2004

PANEL DISCUSSION

- [1] Methods to improve Li-ion battery performance, *2017 IEEE International Conference on Prognostics and Health Management*, Dallas, TX, USA, June 19-21, 2017

OTHER PRESENTATIONS

- [7] Future of Energy - Preparing for Distributed Energy Resources, *APA-AL/MS Annual Conference*, Huntsville, AL, October 18, 2019
- [6] Kindling fires in batteries and minds, *TEDxHuntsville*, Huntsville, AL, September 22, 2019
- [5] In Situ Temperature Sensing and Thermal Management of Lithium-ion Battery Cells, *UAH Department of Physics*, Huntsville, AL, October 23, 2018
- [4] Internal Temperature Sensing and Thermal Management of Large-format Li-ion Battery Cells, *CFD Research Corporation*, Huntsville, AL, June 1, 2018
- [3] Internal temperature sensing and thermal management of large-format Li-ion cells, *Engineering Advisory Board Meeting*, University of Alabama in Huntsville, March 2, 2018
- [2] Internal temperature sensing and thermal management of large-format Li-ion battery cells, *Oak Ridge National Laboratory*, Oak Ridge, TN, October 23, 2017
- [1] Lithium-ion batteries for aerospace applications, University of Alabama in Huntsville, *UAH Student Section of the American Institute of Aeronautics and Astronautics (AIAA)*, October 11, 2017

GOOGLE SCHOLAR PROFILE

<https://scholar.google.com/citations?user=p3eW1xgAAAAJ&hl=en>

PROFESSIONAL SERVICE

Conference Organization

- Lead Track Organizer, *Energy Conversion and Storage Track, ASME InterPACK 2019 Conference*, Anaheim, CA, Oct. 7-9, 2019
- Co-Organizer and Session Chair, *Battery Safety and Failure Modes Symposium, 235th ECS Meeting*, Dallas, TX, May 26-31, 2019
- Session Chair, *ASME InterPACK 2018 Conference*, San Francisco, CA, Aug. 27-30, 2018
- Session Chair, *AiMES 2018 (ECS and SMEQ Joint International Meeting)*, Cancun, Mexico, Sep 30 - Oct 4, 2018
- Co-Organizer and Session Chair, *Battery Safety Symposium, 231st ECS Meeting*, New Orleans, LA, May 28-June 2, 2017

Guest Editor

- ASME Journal of Electronic Packaging (Special Issue InterPACK 2019)
- ECS Transactions (*235th ECS Meeting A06* symposium, "Battery Safety and Failure Modes", Dallas, TX, May 26-31, 2019)

Journal Reviewer

- ACS Applied Materials & Interfaces
- ASME Journal of Electrochemical Energy Conversion and Storage
- Energy & Environmental Science
- Energy Conversion and Management
- International Journal of Heat and Mass Transfer
- International Journal of Hydrogen Energy
- Journal of Power Sources
- Journal of The Electrochemical Society
- Journal of Energy Storage
- Progress in Energy and Combustion Science
- Renewable & Sustainable Energy Reviews
- AIAA Standard ANSI/AIAA S-136-201X: "Safety Standard for Space Lithium Batteries"

Other Service

- MAE Department Undergraduate Committee Member, University of Alabama in Huntsville. 2018 - Present
- Reviewer, College of Engineering Research Symposium (CERS), The Pennsylvania State University, University Park, PA 2016
- Proposal Reviewer for College of Engineering Research Experience for Undergraduates (COEREU), The Pennsylvania State University, University Park, PA 2014, 2015
- Judge for Graduate Exhibition. The 29th Annual Graduate Exhibition, The Pennsylvania State University, University Park, PA 2014

PROFESSIONAL SOCIETY MEMBERSHIP

- American Society of Mechanical Engineers (ASME), 2011 - Present
- International Society of Electrochemistry (ISE), 2014 - Present
- The Electrochemical Society (ECS), 2006 - Present