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Appointments

07/2016 – present: Associate professor, Department of Chemical Engineering and Materials Science, Michigan State University
08/2009 – 06/2016: Assistant professor, Department of Chemical Engineering and Materials Science, Michigan State University

Education

06/2007 Ph. D., Materials Science, California Institute of Technology
06/2001 M. S., Materials Science, University of Science and Technology of China
06/1998 B. S., Materials Science and Engineering, University of Science and Technology of China

Research Experience

10/2007 – 08/2009 Postdoctoral associate working on microbatteries, Materials Science and Engineering, Massachusetts Institute of Technology
10/2001– 10/2007 Research assistant and postdoctoral scholar working on materials for solid oxide fuel cells, California Institute of Technology
09/1997 – 06/2001 Research assistant working on colloidal processing of materials, University of Science and Technology of China

Honors and Awards

- NSF CAREER Award, 2016
- Fellow of the Academy of Global Engagement of Michigan State University, 2015
- Top 25 accessed articles in the Journal of the American Ceramic Society, 2005
- Li Ming Scholarship (selected for being the Chinese student with the best academic performance on course work in each department), California Institute of Technology, 2005
- Graduate Excellence in Materials Science Diamond Award, Basic Science Division, American Ceramic Society, 2005

Peer-reviewed Journal Publications

29. J. C. Li, M. Z. Zhu, D. L. Abernathy, X. L. Ke, D. T. Morelli, and W. Lai, "First-principles studies of atomic dynamics in tetrahedrite thermoelectrics", [APL Mater., 4, 104811 \(2016\)](#)
28. M. Klenk, and W. Lai, "Finite-size effects on the molecular dynamics simulation of fast-ion conductors", [Solid State Ionics, 289, 143 \(2016\)](#)
27. X. Lu, D. T. Morelli, Y. Wang, W. Lai, Y. Xia, and V. Ozolins, "Phase Stability, Crystal Structure, and Thermoelectric Properties of Cu₁₂Sb₄S_{13-x}Sex Solid Solutions", [Chem. Mater., 28, 1781 \(2016\)](#)

26. W. Lai, Y. Wang, D. T. Morelli, and X. Lu, "From bonding asymmetry to anharmonic rattling in Cu₁₂Sb₄S₁₃ tetrahedrites: when lone-pair electrons are not so lonely", [*Adv. Funct. Mater.*, **25**, 3648 \(2015\)](#)
25. J. N. Weker, Y. Li, R. Shanmugam, W. Lai, and W. C. Chueh, "Tracking non-uniform mesoscale transport in LiFePO₄ agglomerates during electrochemical cycling", [*ChemElectroChem*, **2**, 1576 \(2015\)](#)
24. M. Klenk, W. Lai, "Local structure and dynamics of lithium garnet ionic conductors: tetragonal and cubic Li₇La₃Zr₂O₁₂", [*Phys. Chem. Chem. Phys.*, **17**, 8758 \(2015\)](#)
23. Y. Wang, W. Lai, "Phase transition in lithium garnet oxide ionic conductors Li₇La₃Zr₂O₁₂: The role of Ta substitution and H₂O/CO₂ exposure", [*J. Power Sources*, **275**, 612 \(2015\)](#)
22. R. Shanmugam and W. Lai, "Study of Transport Properties and Interfacial Kinetics of Na_{2/3}[Ni_{1/3}Mn_xTi_{2/3-x}]O₂ (x = 0,1/3) as Electrodes for Na-Ion Batteries", [*J. Electrochem. Soc.*, **162**, A8 \(2015\)](#)
21. Y. Wang, M. Klenk, K. Page, W. Lai, "Local Structure and Dynamics of Lithium Garnet Ionic Conductors: A Model Material Li₅La₃Ta₂O₁₂", [*Chem. Mater.*, **26**, 5613 \(2014\)](#)
20. R. Shanmugam and W. Lai, "Na_{2/3}Ni_{1/3}Ti_{2/3}O₂: "Bi-functional" electrode materials for Na-ion Batteries", [*ECS Electrochem. Lett.*, **3**, A23 \(2014\)](#)
19. Y. Wang, A. Huq, and W. Lai, "Insight into lithium distribution in lithium-stuffed garnet oxides through neutron diffraction and atomistic simulation: Li_{7-x}La₃Zr_{2-x}Ta_xO₁₂ (x=0-2) series", [*Solid State Ionics*, **255**, 39 \(2014\)](#)
18. W. C. Chueh, F. E. Gabaly, J. D. Sugar, N. C. Bartelt, A. H. McDaniel, K. R. Fenton, K. R. Zavadil, T. Tyliszczak, W. Lai, and K. F. McCarty, "Intercalation pathway in many-particle LiFePO₄ electrode revealed by nanoscale state-of-charge mapping", [*Nano Lett.*, **13**, 866 \(2013\)](#)
17. F. Ciucci and W. Lai, "Electrochemical impedance spectroscopy of phase transition materials", [*Electrochim. Acta*, **81**, 205 \(2012\)](#)
16. Y. Wang and W. Lai, "High Ionic Conductivity Lithium Garnet Oxides of Li_{7-x}La₃Zr_{2-x}Ta_xO₁₂ Compositions", [*Electrochem. Solid-State Lett.*, **15**, A68 \(2012\)](#)
15. W. Lai, "Electrochemical modeling of single particle intercalation battery materials with different thermodynamics", [*J. Power Sources*, **196**, 6534 \(2011\)](#)
14. F. Ciucci, T. Carraro, W. C. Chueh, and W. Lai, "Reducing error & measurement time in impedance spectroscopy using model based optimal experimental design", [*Electrochim. Acta*, **56**, 5416 \(2011\)](#)
13. W. Lai and F. Ciucci, "Mathematical modeling of porous battery electrodes - revisit of Newman's model", [*Electrochim. Acta*, **56**, 4369 \(2011\)](#)
12. F. Ciucci and W. Lai, "Derivation of micro/macro lithium battery models from homogenization", [*Transp. Porous Med.*, **88**, 249 \(2011\)](#)
11. W. C. Chueh, C.-K. Yang, C. M. Garland, W. Lai, and S. M. Haile, "Unusual decrease in conductivity upon hydration in acceptor doped microcrystalline ceria", [*Phys. Chem. Chem. Phys.*, **13**, 6442 \(2011\)](#)
10. W. Lai and F. Ciucci, "Small-signal apparent diffusion impedance of intercalation battery electrodes", [*J. Electrochem. Soc.*, **158**\(2\), A115 \(2011\)](#)
9. W. Lai and F. Ciucci, "Thermodynamics and kinetics of phase transformation in intercalation battery electrodes - phenomenological modeling", [*Electrochim. Acta*, **56**, 531 \(2010\)](#)

8. W. Lai, "Fourier analysis of complex impedance (amplitude and phase) in nonlinear systems: a case study of diodes", [*Electrochim. Acta*, **55**, 5511 \(2010\)](#)
7. W. Lai, C. K. Erdonmez, T. F. Marinis, C. K. Bjune, N. J. Dudney, F. Xu, R. Wartena, and Y.-M. Chiang, "Ultrahigh energy density microbatteries enabled by new electrode architecture and micropackaging design", [*Adv. Mater.*, **22**, E139 \(2010\)](#)
6. F. Xu, N. J. Dudney, G. M. Veith, Y. Kim, C. K. Erdonmez, W. Lai, and Y.-M. Chiang, "Properties of lithium phosphorus oxynitride (LIPON) for 3D solid-state lithium batteries", [*J. Mater. Res.*, **25**\(8\), 1507 \(2010\)](#)
5. W. C. Chueh, W. Lai, and S. M. Haile, "Electrochemical behavior of ceria with selected metal electrodes", [*Solid State Ionics*, **179**, 1036 \(2008\)](#)
4. W. Lai and S. M. Haile, "Electrochemical impedance spectroscopy of mixed conductors under a chemical potential gradient: A case study of Pt|SDC|BSCF", [*Phys. Chem. Chem. Phys.*, **10**, 865 \(2008\)](#)
3. Y. Hao, Z. P. Shao, J. Mederos, W. Lai, D. G. Goodwin, and S. M. Haile, "Recent advances in single-chamber fuel-cells: Experiment and modeling", [*Solid State Ionics*, **177**, 2013 \(2006\)](#)
2. W. Lai and S. M. Haile, "Impedance spectroscopy as a tool for chemical and electrochemical analysis of mixed conductors: A case study of ceria", [*J. Am. Ceram. Soc.*, **88**, 2979 \(2005\)](#)
1. M. A. Thundathil, W. Lai, L. Noailles, B. S. Dunn, and S. M. Haile, "High surface-area ceria aerogel", [*J. Am. Ceram. Soc.*, **87**\(8\), 1442 \(2004\)](#)

Conference Proceedings

1. Z. Fan, M. Yu, X. Tao, R. Shanmugam Rengarajan, X. Fan, W. Lai, L. X. Dong, "In situ Investigation of Nanoelectrochemical Systems", Proceedings of the 14th IEEE International Conference on Nanotechnology, 882 (2014)

Patents

2. T. F. Marinis, C. K. Bjune, R. Larsen, Y.-M. Chiang, W. Lai, and C. K. Erdonmez, "Small Scale Batteries and Electrodes For Use Thereof", US Patent Publication No: US201100097623 A1, 2008
1. Y.-M. Chiang, R. C. Wartena, T. E. Chin, C. K. Erdonmez, and W. Lai, "Batteries and Electrodes For Use Thereof", US Patent Publication No: US8999571 B2, 2007