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Current Position: R&D Staff Member, Electron and Atom Probe Microscopy Group, Center for Nanophase Materials Sciences, Oak Ridge National Laboratory

Research Interests:

- Understanding and mastering the critical roles of heterogeneity, interfaces and disorders in solid-state energy materials
- Investigating spatial, chemical and temporal evolutions of nanomaterials during synthesis and function using *in situ* microscopy
- Developing advanced functional and in situ imaging and analytical techniques for electron microscopy

Education:

Institution and Location	Degree	Year(s)	Field of Study
University of California, Davis	Ph.D.	09/2003 – 01/ 2008	Materials Science and Engineering
Shanghai Institute of Ceramics	M.E.	09/ 2000 – 07/ 2003	Materials Science and Engineering
Chinese Academy of Sciences Jilin University	B.E.	09/ 1993 – 07/ 1997	Materials Science

Research and Professional Experience:

R&D Staff 09/2013 - present	Center for Nanophase Materials Sciences, Oak Ridge National Laboratory
R&D Associate 09/2008 - 2013	Materials Science and Technology Division, Oak Ridge National Laboratory
Application Scientist 01/2008 – 08/2008	Gatan Co., Pleasanton, CA
Research Fellow 05/2006 – 01/2008	Institute of Geophysics and Planetary Physics, Lawrence Livermore National Laboratory, Livermore, CA
Research Assistant 09/2004 - 04/2006	National Center for Electron Microscopy, Lawrence Berkeley National Laboratory, Berkeley, CA
Research Assistant 09/2003 - 04/2008	Department of Chemical Engineering and Materials Science, University of California, Davis
Research Assistant 07/2000 - 04/2003	Shanghai Institute of Ceramics, Chinese Academy of Sciences, Shanghai, China
Assistant Engineer 07/1997-03/2000	Nippon Carbide Industries (Hangzhou) Co. Ltd., Hangzhou, Zhejiang, China

Publications (Citations: 4011; h-index: 30; i10-index: 52; including *Science* (6), *Nano Letters* (5), *JACS* (5), *Angewandte Chemie – International Edition* (7), *Advanced Materials* (6), and other nanoscience-focused journals)

1. M. Chi, C. Wang, Y. Lei, G. Wang, D. Li, K.L. More, A. Lupini, L.F. Allard, N.M. Markovic, and V.R. Stamenkovic, "Surface Faceting and Elemental Diffusion Behavior at Atomic Scale for Alloy Nanoparticles During In Situ Annealing," *Nature Communications* **6** Article 8925 (2015).
2. L. Zhang, L.T. Roling, X. Wang, M. Vara, M. Chi, J. Liu, S. Choi, J. Park, J. A. Herron, Z. Xie, M. Mavrikakis, and Y. Xia, "Platinum-Based Nanocages with Subnanometer-Thick Walls and Well-Defined Facets," *Science* **349** 412-416 (2015).
3. H. Liu, D.N. Qian, M.G. Verde, M.H. Zhang, L. Baggetto, K. An, Y. Chen, K.J. Carroll, D. Lau, M. Chi, G.M. Veith, and Y.S. Meng, "Understanding the Role of NH_4F and Al_2O_3 Surface Co-Modification on Li-Excess Layered Oxide $Li_{1.2}Ni_{0.2}Mn_{0.6}O_2$," *ACS Applied Materials & Interfaces* **7**[34] 19189-19200 (2015).
4. X. Li, L. Basile, B. Huang, C. Ma, J.W. Lee, I.V. Vlassiouk, A.A. Puretzky, M.W. Lin, M. Yoon, M. Chi, J.C. Idrobo, C.M. Rouleau, B.G. Sumpter, D.B. Geohegan, and K. Xiao, "Van der Waals Epitaxial Growth of Two-Dimensional Single-Crystalline GaSe Domains on Graphene," *ACS Nano* **9**[8] 8078-8088 (2015).
5. X. Wang, S. Choi, L.T. Roling, M. Luo, C. Ma, L. Zhang, M. Chi, J. Liu, Z. Xie, J.A. Herron, M. Mavrikakis, and Y. Xia, "Palladium–Platinum Core-Shell Icosahedra with Substantially Enhanced Activity and Durability Towards Oxygen Reduction," *Nature Communications* **6** Article 7594 (2015).
6. L.H. Wu, J. Yang, M. Chi, S.Y. Wang, P. Wei, W.Q. Zhang, L.D. Chen, and J.H. Yang, "Enhanced Thermoelectric Performance in Cu-Intercalated BiTel by Compensation Weakening Induced Mobility Improvement," *Scientific Reports* **5** Article 14319 (2015).
7. D. Qian, C. Ma, and M. Chi, "Advanced Analytical Electron Microscopy for Lithium-Ion Batteries," *NPG Asia Materials* - Invited Review Article **7**[6] Article e193 (2015).
8. C. Ma, E. Rangasamy, C. Liang, J. Sakamoto, K.L. More, and M. Chi, "Excellent Stability of a Lithium-Ion-Conducting Solid Electrolyte upon Reversible Li^+/H^+ Exchange in Aqueous Solutions," *Angewandte Chemie International Edition* **54**[1] 129-133 (2015).
9. B.H. Han, D.N. Qian, M. Risch, H.L. Chen, M. Chi, and Y. Shao-Horn, "Role of $LiCoO_2$ Surface Terminations in Oxygen Reduction and Evolution Kinetics," *Journal of Physical Chemistry Letters* **6**[8] 1357-1362 (2015).
10. Y. Wu, C. Ma, J. Yang, Z. Li, C. Liang, L.F. Allard, and M. Chi, "Probing the Initiation of Voltage Decay in Li-Rich Layered Cathode Materials at Atomic Scale," *Journal of Materials Chemistry A* **3**[10] 5385-5391 (2015).
11. J.K. Kim, B. Sentilkumar, S.H. Sahgong, J.H. Kim, M. Chi, and Y. Kim, "New Chemical Route for the Synthesis of β-$Na_{0.33}V_2O_5$ and Its Fully Reversible Li Intercalation," *ACS Applied Materials & Interfaces* **7**[12] 7025-7032 (2015).
12. W.S. Wang, Y.F. Ye, J. Feng, M. Chi, J.H. Guo, and Y.D. Yin, "Enhanced Photoreversible Color Switching of Redox Dyes Catalyzed by Barium-Doped TiO_2 Nanocrystals," *Angewandte Chemie International Edition* **54**[4] 1321-1326 (2015).
13. X.F. Li, L. Basile, M. Yoon, C. Ma, A.A. Puretzky, J.C. Idrobo, M. Chi, C.M. Rouleau, and D.B. Geohegan, "Revealing the Preferred Interlayer Orientation and Stackings of Two-Dimensional Bilayer Gallium Selenide Crystals," *Angewandte Chemie International Edition* **54**[9] 2712-2717 (2015).
14. J.C. Li, C. Ma, M. Chi, C. Liang, and N.J. Dudney, "Solid Electrolyte: The Key for High-Voltage Lithium Batteries," *Advanced Energy Materials* **5**[4] Article 1401408 (2015).
15. W.S. Wang, Y.F. Ye, J. Feng, M. Chi, J.H. Guo, and Y.D. Yin, "Enhanced Photoreversible Color Switching of Redox Dyes Catalyzed by Barium-Doped TiO_2 Nanocrystals," *Angewandte Chemie International Edition* **54**[4] 1321-1326 (2015).

16. H. Yang, P.G. Kotula, Y. Sato, M. Chi, Y. Ikuhara, and N.D. Browning, "Segregation of Mn2+ Dopants as Interstitials in $SrTiO_3$ Grain Boundaries," *Materials Research Letters* **2**[1] 16-22 (2014).
17. Y. Wang, S.I. Choi, X. Zhao, S. Xie, H.C. Peng, M. Chi, C.Z. Huang, and Y. Xia, "Polyol Synthesis of Ultrathin Pd Nanowires via Attachment-Based Growth and Their Enhanced Activity towards Formic Acid Oxidation," *Advanced Functional Materials* **24**[1] 131-139 (2014).
18. N. Shin, M. Chi, and M.A. Filler, "Interplay between Defect Propagation and Surface Hydrogen in Silicon Nanowire Kinking Superstructures," *ACS Nano* **8**[4] 3829-3835 (2014).
19. Z.A. Qiao, P.F. Zhang, S.H. Chai, M. Chi, G.M. Veith, N.C. Gallego, M. Kidder, and S. Dai, "Lab-in-a-Shell: Encapsulating Metal Clusters for Size Sieving Catalysis," *Journal of The American Chemical Society* **136**[32] 11260-11263 (2014).
20. D. Qian, B. Xu, M. Chi, and Y.S. Meng, "Uncovering the Roles of Oxygen Vacancy on Cation Migration in Lithium Excess Layered Oxides," *Physical Chemistry Chemical Physics* **16**[28] 14665-14668 (2014).
21. A.K. Naskar, Z.H. Bi, Y.C. Li, S.K. Akato, D. Saha, M. Chi, C.A. Bridges, and M.P. Paranthaman, "Tailored Recovery of Carbons from Waste Tires for Enhanced Performance as Anodes in Lithium-Ion Batteries," *RSC Advances* **4**[72] 38213-38221 (2014).
22. C. Ma, K. Chen, C. Liang, C.W. Nan, R. Ishikawa, K.L. More, and M. Chi, "Atomic-Scale Origin of the Large Grain-Boundary Resistance in Perovskite Li-Ion-Conducting Solid Electrolytes," *Energy & Environmental Science* **7**[5] 1638-1642 (2014).
23. X. Li, M.-W. Lin, A.A. Puretzky, J.C. Idrobo, C. Ma, M. Chi, M. Yoon, C.M. Rouleau, I.I. Kravchenko, and D.B. Geohegan, "Controlled Vapor Phase Growth of Single Crystalline, Two-Dimensional GaSe Crystals with High Photoresponse," *Scientific Report* **4** 5497 (2014).
24. D.G. Li, C. Wang, D.S. Strmcnik, D.V. Tripkovic, X.L. Sun, Y.J. Kang, M. Chi, J. D. Snyder, D. van der Vliet, Y.F. Tsai, V.R. Stamenkovic, S.H. Sun, and N.M. Markovic, "Functional Links between Pt Single Crystal Morphology and Nanoparticles with Different Size and Shape: The Oxygen Reduction Reaction Case," *Energy & Environmental Science* **7**[12] 4061-4069 (2014).
25. J.-H. Kim, A. Huq, M. Chi, N.P.W. Pieczonka, E. Lee, C.A. Bridges, M.M. Tessema, A. Manthiram, K.A. Persson, and B.R. Powell, "Integrated Nano-Domains of Disordered and Ordered Spinel Phases in $LiNi_{0.5}Mn_{1.5}O_4$ for Li-Ion Batteries," *Chemistry of Materials* **26**[15] 4377-4386 (2014).
26. Y.J. Kang, J. Snyder, M. Chi, D.G. Li, K.L. More, N.M. Markovic, and V.R. Stamenkovic, "Multimetallic Core/Interlayer/Shell Nanostructures as Advanced Electrocatalysts," *Nano Letters* **14**[11] 6361-6367 (2014).
27. B. Guo, X. Yu, X.-G. Sun, M. Chi, Z.-A. Qiao, J. Liu, Y.-S. Hu, X.-Q. Yang, J.B. Goodenough, and S. Dai, "A Long-Life Lithium-Ion Battery with a Highly Porous $TiNb_2O_7$ Anode for Large-Scale Electrical Energy Storage," *Energy & Environmental Science* **7**[7] 2220-2227 (2014).
28. C. Gao, Y. Hu, M. Wang, M. Chi, and Y. Yin, "Fully Alloyed Ag/Au Nanospheres: Combining the Plasmonic Property of Ag with the Stability of Au," *Journal of The American Chemical Society* **136**[20] 7474-7479 (2014).
29. C. Chen, Y. Kang, Z. Huo, Z. Zhu, W. Huang, H.L. Xin, J.D. Snyder, D. Li, J.A. Herron, M. Mavrikakis, M. Chi, K.L. More, Y.D. Li, N.M. Markovic, and V.R. Stamenkovic, "Highly Crystalline Multimetallic Nanoframes with Three-Dimensional Electrocatalytic Surfaces," *Science* **343** 1339-1343 (2014).
30. W.C. Barnhill, J. Qu, H.M. Luo, H.M. Meyer, C. Ma, M. Chi, and B.L. Papke, "Phosphonium-Organophosphate Ionic Liquids as Lubricant Additives: Effects of Cation Structure on Physicochemical and Tribological Characteristics," *ACS Applied Materials & Interfaces* **6**[24] 22585-22593 (2014).

31. Z.B. Cai, H.M. Meyer, C. Ma, M. Chi, H.M. Luo, and J. Qu, "Comparison of the Tribological Behavior of Steel-Steel and Si_3N_4-Steel Contacts in Lubricants with ZDDP or Ionic Liquid," *Wear* **319**[1-2] 172-183 (2014).
32. H.H. Elsentriecy, J. Qu, H.M. Luo, H.M. Meyer, C. Ma, and M. Chi, "Improving Corrosion Resistance of AZ31B Magnesium Alloy via a Conversion Coating Produced by a Protic Ammonium-Phosphate Ionic Liquid," *Thin Solid Films* **568** 44-51 (2014).
33. J. Qu, H.M. Luo, M. Chi, C. Ma, P.J. Blau, and S. Dai, "Comparison of an Oil-Miscible Ionic Liquid and ZDDP as a Lubricant Anti-Wear Additive," *Tribological International* **71** 88-97 (2014).
34. P. Zhang, Y. Shi, M. Chi, J.-N. Park, G.D. Stucky, E.W. McFarland, and L. Gao, "Mesoporous Delafossite $CuCrO_2$ and Spinel $CuCr_2O_4$: Synthesis and Catalysis," *Nanotechnology* **24**[34] 345704 (2013).
35. Z. Yin, M. Chi, Q. Zhu, D. Ma, J. Sun, and X. Bao, "Supported Bimetallic PdAu Nanoparticles with Superior Electrocatalytic Activity Towards Methanol Oxidation," *Journal of Materials Chemistry A* **1**[32] 9157-9163 (2013).
36. H. Yang, H. Lee, M. Sarahan, Y. Sato, M. Chi, P. Moeck, Y. Ikuhara, and N.D. Browning, "Quantifying Stoichiometry-Induced Variations in Structure and Energy of a $SrTiO_3$ Symmetric Σ13 {510}/< 100> Grain Boundary," *Philosophical Magazine* **93**[10-12] 1219-1229 (2013).
37. A.R. Wilson, K. Sun, M. Chi, R.M. White, J.M. LeBeau, H.H. Lamb, and B.J. Wiley, "From Core–Shell to Alloys: The Preparation and Characterization of Solution-Synthesized AuPd Nanoparticle Catalysts," *Journal of Physical Chemistry C* **117**[34] 17557-17566 (2013).
38. W. Wang, J. Zhao, W. Wang, Z. Gai, N. Balke, M. Chi, H.N. Lee, W. Tian, L. Zhu, and X. Cheng, "Room-Temperature Multiferroic Hexagonal $LuFeO_3$ Films," *Physical Review Letters* **110**[23] 237601 (2013).
39. N. Shin, M. Chi, J.Y. Howe, and M.A. Filler, "Rational Defect Introduction in Silicon Nanowires," *Nano Letters* **13**[5] 1928-1933 (2013).
40. N. Shin, M. Chi, and M.A. Filler, "Sidewall Morphology-Dependent Formation of Multiple Twins in Si Nanowires," *ACS Nano* **7**[9] 8206-8213 (2013).
41. Ö. Metin, S.F. Ho, C. Alp, H. Can, M.N. Mankin, M.S. Gültekin, M. Chi, and S. Sun, "Ni/Pd Core/Shell Nanoparticles Supported on Graphene as a Highly Active and Reusable Catalyst for Suzuki-Miyaura Cross-Coupling Reaction," *Nano Research* **6**[1] 10-18 (2013).
42. T. Lv, Y. Wang, S.I. Choi, M. Chi, J. Tao, L. Pan, C.Z. Huang, Y. Zhu, and Y. Xia, "Controlled Synthesis of Nanosized Palladium Icosahedra and Their Catalytic Activity Towards Formic-Acid Oxidation," *ChemSusChem* **6**[10] 1923-1930 (2013).
43. C. Li, Y. Yu, M. Chi, and L. Cao, "Epitaxial Nanosheet–Nanowire Heterostructures," *Nano Lett*ers **13**[3] 948-953 (2013).
44. Y. Kim, N.J. Dudney, M. Chi, S.K. Martha, J. Nanda, G.M. Veith, and C. Liang, "A Perspective on Coatings to Stabilize High-Voltage Cathodes: $LiMn_{1.5}Ni_{0.5}O_4$ with Sub-nanometer Lipon Cycled with $LiPF_6$ Electrolyte," *Journal of The Electrochemical Society* **160**[5] A3113-A3125 (2013).
45. Y. Janssen, D. Santhanagopalan, D. Qian, M. Chi, X. Wang, C. Hoffmann, Y.S. Meng, and P.G. Khalifah, "Reciprocal Salt Flux Growth of $LiFePO_4$ Single Crystals with Controlled Defect Concentrations," *Chemistry of Materials* **25**[22] 4574-4584 (2013).
46. F. Fang, E. Iyyamperumal, M. Chi, G. Keskar, M. Majewska, F. Ren, C. Liu, G. L. Haller, and L.D. Pfefferle, "Templated One-Step Catalytic Fabrication of Uniform Diameter Mg_xB_y Nanostructures," *Journal of Materials Chemistry C* **1**[14] 2568-2576 (2013).
47. C.R. Fell, D. Qian, K.J. Carroll, M. Chi, J.L. Jones, and Y.S. Meng, "Correlation Between Oxygen Vacancy, Microstrain, and Cation Distribution in Lithium-Excess Layered Oxides during the First Electrochemical Cycle," *Chemistry of Materials* **25**[9] 1621-1629 (2013).

48. K.J. Carroll, D. Qian, C. Fell, S. Calvin, G.M. Veith, M. Chi, L. Baggetto, and Y.S. Meng, "Probing the Electrode/Electrolyte Interface in the Lithium Excess Layered Oxide $Li_{1.2}Ni_{0.2}Mn_{0.6}O_2$," *Physical Chemistry Chemical Physics* **15**[26] 11128-11138 (2013).
49. Z. Bi, M.P. Paranthaman, P.A. Menchhofer, R.R. Dehoff, C.A. Bridges, M. Chi, B. Guo, X.-G. Sun, and S. Dai, "Self-Organized Amorphous TiO_2 Nanotube Arrays on Porous Ti Foam for Rechargeable Lithium and Sodium Ion Batteries," *Journal of Power Sources* **222** 461-466 (2013).
50. C. Beekman, W. Siemons, T. Ward, M. Chi, J.Y. Howe, M. Biegalski, N. Balke, P. Maksymovych, A. Farrar, and J. Romero, "Phase Transitions, Phase Coexistence, and Piezoelectric Switching Behavior in Highly Strained $BiFeO_3$ Films," *Advanced Materials* **25**[39] 5560-5560 (2013).
51. C. Aydin, A. Kulkarni, M. Chi, N.D. Browning, and B.C. Gates, "Three-Dimensional Structural Analysis of MgO-Supported Osmium Clusters by Electron Microscopy with Single-Atom Sensitivity," *Angewandte Chemie International Edition* **125**[20] 5370-5373 (2013).
52. W. Wang, Z. Gai, M. Chi, J.D. Fowlkes, J. Yi, L. Zhu, X. Cheng, D.J. Keavney, P.C. Snijders, and T.Z. Ward, "Growth Diagram and Magnetic Properties of Hexagonal $LuFe_2O_4$ Thin Films," *Physical Review B* **85**[15] 155411 (2012).
53. C. Wang, D. Li, M. Chi, J. Pearson, R.B. Rankin, J. Greeley, Z. Duan, G. Wang, D. Van der Vliet, and K.L. More, "Rational Development of Ternary Alloy Electrocatalysts," *Journal of Physical Chemistry Letters* **3**[12] 1668-1673 (2012).
54. C. Tian, S.-H. Chai, X. Zhu, Z. Wu, A. Binder, J.C. Bauer, S. Brwon, M. Chi, G.M. Veith, and Y. Guo, "In Situ Growth Synthesis of Heterostructured $LnPO_4$–SiO_2 (Ln= La, Ce, and Eu) Mesoporous Materials as Supports for Small Gold Particles used in Catalytic CO Oxidation," *Journal of Materials Chemistry* **22**[48] 25227-25235 (2012).
55. A.R. Rathmell, M. Nguyen, M. Chi, and B.J. Wiley, "Synthesis of Oxidation-Resistant Cupronickel Nanowires for Transparent Conducting Nanowire Networks," *Nano Letters* **12**[6] 3193-3199 (2012).
56. J. Qu, H. Li, J.J. Henry Jr, S.K. Martha, N.J. Dudney, H. Xu, M. Chi, M.J. Lance, S.M. Mahurin, and T.M. Besmann, "Self-Aligned Cu–Si Core–Shell Nanowire Array as a High-Performance Anode for Li-Ion Batteries," *Journal of Power Sources* **198** 312-317 (2012).
57. Z.A. Qiao, Q. Huo, M. Chi, G.M. Veith, A.J. Binder, and S. Dai, "A "Ship-In-A-Bottle Approach to Synthesis of Polymer Dots@Silica or Polymer Dots@Carbon Core-Shell Nanospheres," *Advanced Materials* **24**[45] 6017-6021 (2012).
58. V. Mazumder, M. Chi, M.N. Mankin, Y. Liu, O.N. Metin, D. Sun, K.L. More, and S. Sun, "A Facile Synthesis of MPd (M= Co, Cu) Nanoparticles and Their Catalysis for Formic Acid Oxidation," *Nano Letters* **12**[2] 1102-1106 (2012).
59. G. Ma, A. Binder, M. Chi, C. Liu, R. Jin, D.-E. Jiang, J. Fan, and S. Dai, "Stabilizing Gold Clusters by Heterostructured Transition-Metal Oxide–Mesoporous Silica Supports for Enhanced Catalytic Activities for CO Oxidation," *Chemical Communications* **48**[93] 11413-11415 (2012).
60. B. Guo, M. Chi, X.-G. Sun, and S. Dai, "Mesoporous Carbon–Cr_2O_3 Composite as an Anode Material for Lithium Ion Batteries," *Journal of Power Sources* **205** 495-499 (2012).
61. C. Gao, Z. Lu, Y. Liu, Q. Zhang, M. Chi, Q. Cheng, and Y. Yin, "Highly Stable Silver Nanoplates for Surface Plasmon Resonance Biosensing," *Angewandte Chemie International Edition* **51**[23] 5629-5633 (2012).
62. C.R. Fell, M. Chi, Y.S. Meng, and J.L. Jones, "In Situ X-ray Diffraction Study of the Lithium Excess Layered Oxide Compound Li $[Li_{0.2}Ni_{0.2}Mn_{0.6}]$ O_2 During Electrochemical Cycling," *Solid State Ionics* **207** 44-49 (2012).
63. C. Aydin, A. Kulkarni, M. Chi, N.D. Browning, and B.C. Gates, "Atomically Resolved Site-Isolated Catalyst on MgO: Mononuclear Osmium Dicarbonyls formed from $Os_3(CO)_{12}$," *Journal of Physical Chemistry Letters* **3**[14] 1865-1871 (2012).

64. Q. Zhang, D.Q. Lima, I. Lee, F. Zaera, M. Chi, and Y. Yin, "A Highly Active Titanium Dioxide Based Visible-Light Photocatalyst with Nonmetal Doping and Plasmonic Metal Decoration," *Angewandte Chemie International Edition* **123**[31] 7226-7230 (2011).
65. M. Chi, T. Mizoguchi, L. W. Martin, J.P. Bradley, H. Ikeno, R. Ramesh, I. Tanaka, and N. Browning, "Atomic and Electronic Structures of the $SrVO_3$-$LaAlO_3$ Interface," *Journal of Applied Physics* **110**[4] 046104 (2011).
66. H. Yin, Z. Ma, M. Chi, and S. Dai, "Heterostructured Catalysts Prepared by Dispersing Au@Fe_2O_3 Core–Shell Structures on Supports and Their Performance in CO Oxidation," *Catalysis Today* **160**[1] 87-95 (2011).
67. J. Xu, A.R. Wilson, A.R. Rathmell, J.Y. Howe, M. Chi, and B.J. Wiley, "Synthesis and Catalytic Properties of Au–Pd Nanoflowers," *ACS Nano* **5**[8] 6119-6127 (2011).
68. B. Xu, C.R. Fell, M. Chi, and Y.S. Meng, "Identifying Surface Structural Changes in Layered Li-Excess Nickel Manganese Oxides in High Voltage Lithium Ion Batteries: A Joint Experimental and Theoretical Study," *Energy & Environmental Sciences* **4**[6] 2223-2233 (2011).
69. C. Wang, M. Chi, G. Wang, D. Van der Vliet, D. Li, K.L. More, H.H. Wang, J.A. Schlueter, N.M. Markovic, and V.R. Stamenkovic, "Correlation Between Surface Chemistry and Electrocatalytic Properties of Monodisperse Pt_xNi_{1-x} Nanoparticles," *Advanced Functional Materials* **21**[1] 147-152 (2011).
70. C. Wang, M. Chi, D. Li, D. van der Vliet, G. Wang, Q. Lin, J.F. Mitchell, K.L. More, N.M. Markovic, and V.R. Stamenkovic, "Synthesis of Homogeneous Pt-Bimetallic Nanoparticles as Highly Efficient Electrocatalysts," *ACS Catalysis* **1**[10] 1355-1359 (2011).
71. C. Wang, M. Chi, D. Li, D. Strmcnik, D. Van der Vliet, G. Wang, V. Komanicky, K.-C. Chang, A.P. Paulikas, and D. Tripkovic, "Design and Synthesis of Bimetallic Electrocatalyst with Multilayered Pt-Skin Surfaces," *Journal of The American Chemical Society* **133**[36] 14396-14403 (2011).
72. I. Vlassiouk, S. Smirnov, I. Ivanov, P. F. Fulvio, S. Dai, H. Meyer, M. Chi, D. Hensley, P. Datskos, and N.V. Lavrik, "Electrical and Thermal Conductivity of Low Temperature CVD Graphene: The Effect of Disorder," *Nanotechnology* **22**[27] 275716 (2011).
73. P.P. Sun, G. Siddiqi, W. C. Vining, M. Chi, and A.T. Bell, "Novel Pt/Mg(In)(Al)O Catalysts for Ethane and Propane Dehydrogenation," *Journal of Catalysis* **282**[1] 165-174 (2011).
74. X. Shi, J. Yang, J.R. Salvador, M. Chi, J.Y. Cho, H. Wang, S. Bai, J. Yang, W. Zhang, and L. Chen, "Multiple-Filled Skutterudites: High Thermoelectric Figure of Merit through Separately Optimizing Electrical and Thermal Transports," *Journal of The American Chemical Society* **133**[20] 7837-7846 (2011).
75. M. C. Sarahan, M. Chi, D. J. Masiel, and N. D. Browning, "Point Defect Characterization in HAADF-STEM Images using Multivariate Statistical Analysis," *Ultramicroscopy* **111**[3] 251-257 (2011).
76. J. Qu, M. Chi, H.M. Meyer III, P.J. Blau, S. Dai, and H. Luo, "Nanostructure and Composition of Tribo-Boundary Films Formed in Ionic Liquid Lubrication," *Tribology Letters* **43**[2] 205-211 (2011).
77. S. Mehraeen, A. Kulkarni, M. Chi, B.W. Reed, N.L. Okamoto, N.D. Browning, and B.C. Gates, "Triosmium Clusters on a Support: Determination of Structure by X-ray Absorption Spectroscopy and High-Resolution Microscopy," *Chemistry-A European Journal* **17**[3] 1000-1008 (2011).
78. Z. Lu, C. Gao, Q. Zhang, M. Chi, J.Y. Howe, and Y. Yin, "Direct Assembly of Hydrophobic Nanoparticles to Multifunctional Structures," *Nano Letters* **11**[8] 3404-3412 (2011).
79. Y. Liu, M. Chi, V. Mazumder, K. L. More, S. Soled, J. D. Henao, and S. Sun, "Composition-Controlled Synthesis of Bimetallic PdPt Nanoparticles and Their Electro-Oxidation of Methanol," *Chemistry of Materials* **23**[18] 4199-4203 (2011).

80. H. Li, J. Qu, Q. Cui, H. Xu, H. Luo, M. Chi, R.A. Meisner, W. Wang, and S. Dai, "TiO_2 Nanotube Arrays Grown in Ionic Liquids: High-Efficiency in Photocatalysis and Pore-Widening," *Journal of Materials Chemistry* **21**[26] 9487-9490 (2011).
81. Y. Kim, G.M. Veith, J. Nanda, R.R. Unocic, M. Chi, and N.J. Dudney, "High Voltage Stability of $LiCoO_2$ Particles with a Nano-Scale Lipon Coating," *Electrochimica Acta* **56**[19] 6573-6580 (2011).
82. B. Guo, X. Wang, P.F. Fulvio, M. Chi, S.M. Mahurin, X.G. Sun, and S. Dai, "Soft-Templated Mesoporous Carbon-Carbon Nanotube Composites for High Performance Lithium‐ion Batteries," *Advanced Materials* **23**[40] 4661-4666 (2011).
83. P. Zhang, M. Chi, S. Sharma, and E. McFarland, "Silica Encapsulated Heterostructure Catalyst of Pt Nanoclusters on Hematite Nanocubes: Synthesis and Reactivity," *Journal of Materials Chemistry* **20**[10] 2013-2017 (2010).
84. H. Yin, Z. Ma, H. Zhu, M. Chi, and S. Dai, "Evidence for and Mitigation of the Encapsulation of Gold Nanoparticles Within Silica Supports upon High-Temperature Treatment of Au/SiO_2 Catalysts: Implication to Catalyst Deactivation," *Applied Catalysis A: General* **386**[1] 147-156 (2010).
85. H. Yin, Z. Ma, M. Chi, and S. Dai, "Activation of Dodecanethiol-Capped Gold Catalysts for CO Oxidation by Treatment with $KMnO_4$ or K_2MnO_4," *Catalysis Letters* **136**[3-4] 209-221 (2010).
86. X. Wang, P.F. Fulvio, G.A. Baker, G.M. Veith, R.R. Unocic, S.M. Mahurin, M. Chi, and S. Dai, "Direct Exfoliation of Natural Graphite into Micrometre Size Few Layers Graphene Sheets using Ionic Liquids," *Chemical Communications* **46**[25] 4487-4489 (2010).
87. P.P. Sun, G. Siddiqi, M. Chi, and A.T. Bell, "Synthesis and Characterization of a New Catalyst Pt/Mg(Ga)(Al)O for Alkane Dehydrogenation," *Journal of Catalysis* **274**[2] 192-199 (2010).
88. X. Shi, J. Yang, S. Bai, J. Yang, H. Wang, M. Chi, J.R. Salvador, W. Zhang, L. Chen, and W. Wong-Ng, "On the Design of High-Efficiency Thermoelectric Clathrates through a Systematic Cross-Substitution of Framework Elements," *Advanced Functional Materials* **20**[5] 755-763 (2010).
89. E.M. Sabio, M. Chi, N.D. Browning, and F.E. Osterloh, "Charge Separation in a Niobate Nanosheet Photocatalyst Studied with Photochemical Labeling," *Langmuir* **26**[10] 7254-7261 (2010).
90. P. Qian, H. Gu,and M. Chi, "The Emergence of Intergranular Precipitates in TiO_2-Doped α-Al_2O_3 Ceramics," *Journal of the American Ceramic Society* **93**[2] 326-329 (2010).
91. V. Mazumder, M. Chi, K.L. More, and S. Sun, "Synthesis and Characterization of Multimetallic Pd/Au and Pd/Au/FePt Core/Shell Nanoparticles," *Angewandte Chemie International Edition* **49**[49] 9368-9372 (2010).
92. V. Mazumder, M. Chi, K.L. More, and S. Sun, "Core/Shell Pd/FePt Nanoparticles as an Active and Durable Catalyst for the Oxygen Reduction Reaction," *Journal of The American Chemical Society* **132**[23] 7848-7849 (2010).
93. A. Kulkarni, M. Chi, V. Ortalan, N.D. Browning, and B.C. Gates, "Atomic Resolution of the Structure of a Metal–Support Interface: Triosmium Clusters on MgO (110)," *Angewandte Chemie International Edition* **49**[52] 10089-10092 (2010).
94. C.R. Fell, K.J. Carroll, M. Chi, and Y.S. Meng, "Synthesis–Structure–Property Relations in Layered,"Li-excess" Oxides Electrode Materials Li $[Li_{1/3-2x}/3Ni_xMn_{2/3-x/3}]O_2$ (x= 1/3, 1/4, and 1/5)," *Journal of The Electrochemical Society* **157**[11] A1202-A1211 (2010).
95. M. Cargnello, C. Gentilini, T. Montini, E. Fonda, S. Mehraeen, M. Chi, M. Herrera-Collado, N.D. Browning, S. Polizzi, and L. Pasquato, "Active and Stable Embedded Au@CeO_2 Catalysts for Preferential Oxidation of CO," *Chemistry of Materials* **22**[14] 4335-4345 (2010).
96. N.D. Browning, M. Chi, B.C. Gates, and V. Ortalan, "Atomic Resolution of the Structure of a Metal Support Interface: Triosmium Clusters on MgO (110)," *Angewandte Chemie International Edition* **49**[52] 10089-10092 (2010).

97. J. Sun, M. Chi, R.J. Lobo-Lapidus, S. Mehraeen, N.D. Browning, and B.C. Gates, "Tantalum Clusters Supported on Silica-Alumina: Influence of Support Composition and Chemistry on Cluster Structure," *Langmuir* **25**[18] 10754-10763 (2009).
98. M. Chi, H.A. Ishii, S.B. Simon, J.P. Bradley, Z. Dai, D. Joswiak, N.D. Browning, and G. Matrajt, "The Origin of Refractory Minerals in Comet 81P/Wild 2," *Geochimica et Cosmochimica Acta* **73**[23] 7150-7161 (2009).
99. J.P. Buban, M. Chi, D. J. Masiel, J.P. Bradley, B. Jiang, H. Stahlberg, and N.D. Browning, "Structural Variability of Edge Dislocations in a $SrTiO_3$ Low-Angle [001] Tilt Grain Boundary," *Journal of Materials Research* **24**[7] 2191-2199 (2009).
100. M. Zolensky, K. Nakamura-Messenger, M. Chi, F. Rietmeijer, H. Leroux, T. Mikouchi, K. Ohsumi, S. Simon, L. Grossman, T. Stephan, and M. Weisberg, "Comparing Wild 2 Particles to Chondrites and IDPs," *Meteoritics & Planetary Science* **43**[1-2] 261-272 (2008).
101. S. Simon, D. Joswiak, H. Ishii, J. Bradley, M. Chi, L. Grossman, J. Aléon, D. Brownlee, S. Fallon, and I. Hutcheon, "A Refractory Inclusion Returned by Stardust from Comet 81P/Wild 2," *Meteoritics & Planetary Science* **43**[11] 1861-1877 (2008).
102. B. Nelson-Cheeseman, F. Wong, R. Chopdekar, M. Chi, E. Arenholz, N. Browning, and Y. Suzuki, "Interface Structure and Transport of Complex Oxide Junctions," *Journal of Vacuum Science & Technology B* **26**[4] 1521-1525 (2008).
103. H.A. Ishii, J.P. Bradley, Z.R. Dai, M. Chi, A.T. Kearsley, M.J. Burchell, N.D. Browning, and F. Molster, "Comparison of Comet 81P/Wild 2 Dust with Interplanetary Dust from Comets," *Science* **319** 447-450 (2008).
104. H. Ishii, J. Bradley, Z. Dai, M. Chi, A. Kearsley, M. Burchell, and N. Browning, F. Molster, "Results from the Search for Typical CPIDP Silicates in Comet 81P/wild 2 Dust Samples," *Meteoritics & Planetary Science* **43**[7] A65-A65 (2008).
105. M. Herrera, M. Chi, M. Bonds, N. Browning, J.N. Woolman, R.E. Kvaas, S.F. Harris, D.R. Rhiger, and C.J. Hill, "Atomic Scale Analysis of the Effect of the SiO_2 Passivation Treatment on InAs/GaSb Superlattice Mesa Sidewall," *Applied Physics Letters* **93**[9] 093106-093103 (2008).
106. L.F. Fu, N.L. Okamota, M. Chi, N.D. Browning, and H.S. Jung, "Frank Dislocation Loops in HgTe/CdTe Superlattices on CdTe/Si(211)B Substrates," *Journal of Applied Physics* **104**[2] Article 023104 (2008).
107. L. W. Martin, Q. Zhan, Y. Suzuki, R. Ramesh, M. Chi, N.D. Browning, T. Mizoguchi, and J. Kreisel, "Growth and Structure of $PbVO_3$ Thin Films," *Applied Physics Letters* **90**[6] Article 062903 (2007).
108. K.A. Bogle, S. Ghosh, S.D. Dhole, V.N. Bhoraskar, L.F. Fu, M. Chi, N.D. Browning, D. Kundaliya, G.P. Das, and S.B. Ogale, "Co: CdS Diluted Magnetic Semiconductor Nanoparticles: Radiation Synthesis, Dopant-Defect Complex Formation, and Unexpected Magnetism," *Chemistry of Materials* **20**[2] 440-446 (2007).
109. M.E. Zolensky, T.J. Zega, H. Yano, S. Wirick, M. Chi, A.J. Westphal, M.K. Weisberg, I. Weber, J.L. Warren, M.A. Velbel, and A. Tsuchiyama, "Mineralogy and Petrology of Comet 81P/Wild 2 Nucleus Samples," *Science* **314** 1735-1739 (2006).
110. F. Hörz, R. Bastien, J. Borg, J. P. Bradley, J. C. Bridges, D. E. Brownlee, M. J. Burchell, M. Chi, M. J. Cintala, and Z.R. Dai, "Impact Features on Stardust: Implications for Comet 81P/Wild 2 Dust," *Science* **314** 1716-1719 (2006).
111. M. Chi, N.D. Browning, and N. Orlovskaya, "Microstructural Evolution of Protective La–Cr–O Films Studied by Transmission Electron Microscopy," *Journal of Solid State Electrochemistry* **10**[8] 659-662 (2006).
112. D. Brownlee, P. Tsou, J. Aléon, M. Chi,…,… S. Bajt, G. A. Baratta, R. Bastien, P. Bland, and P. Bleuet, "Comet 81P/Wild 2 Under a Microscope," *Science* **314** 1711-1716 (2006).

113. M. Chi, H. Gu, P. Qian, X. Wang, and P. Wang, "Effect of TiO_2–SiO_2 Distribution on Bimodal Microstructure of TiO_2-doped α-Al_2O_3 Ceramics," *Zeitschrift für Metallkunde* **96**[5] 486-492 (2005).
114. M. Chi and H. Gu, "Comparison of Segregation Behaviors for Special and General Boundaries in Polycrystalline Al_2O_3 with SiO_2-TiO_2 Impurities," *Interface Science* **12**[2-3] 335-342 (2004).
115. M. Chi, H. Gu, X. Wang, and P. Wang, "Evidence of Bilevel Solubility in the Bimodal Microstructure of TiO_2-Doped Alumina," *Journal of the American Ceramic Society* **86**[11] 1953-1955 (2003).

Book Chapter:
N.D. Browning, J. Buban, M. Chi, B. Gipson, M. Herrera, D. Masiel, S. Mehraeen, D. Morgan, N. Okamoto, and Q. Ramasse, in Modeling Nanoscale Imaging in Electron Microscopy (Springer US, 2012) pp. 11-40.

Patent:
X. Qiu, M. Parans Paranthaman, M. Chi, I.N. Ivanov, Z. Zhang. (US Patent 20,130,045,383, 2013).

Significant Awards and Honors:
- Director's Award for Outstanding Accomplishment in Science & Technology, ORNL Awards Night (2015).
- Early Career Researcher Award, ORNL Awards Night (2015).
- Significant Event Award, Oak Ridge National Laboratory (2015).
- Awarded - Most Publications in Division, Materials Science & Technology Division, ORNL (2010).
- Lawrence Graduate Student Research Fellowship at Lawrence Livermore National Laboratory, Livermore, CA (2006-2008).
- Distinguished Scholar Award (MAS), Microscopy & Microanalysis 2007 Annual Meeting, Fort Lauderdale, FL (2007).
- Graduate Student Award, 11th Frontiers of Electron Microscopy in Materials Science Conference (2007).

Invited Presentations:
- The Electrochemical Society, University of Kentucky Chapter, "Probing Interfacial Charge Transfer Mechanism of Solid Electrolytes in Li-ion Batteries," (2015).
- International Conference of Pacific Rim Ceramic Societies (PacRim-11), Jeju Island, Korea. "Stability & Conductivity of Solid Electrolytes and Their Interfaces: A Microscopic Perspective" (2015).
- Georgia Institute of Technology, Atlanta, GA. "Advanced Electron Microscopy for Energy Storage" (2014).
- Battery Congress, Troy, MI. "Advanced Electron Microscopy for Li-battery Oxide Cathode Materials for Li-Batteries" (2013).
- American Chemical Society, Indianapolis, IN. "Advanced Electron Microscopy for Energy Storage" (2013).
- Microscopy & Microanalysis 2011 Annual Meeting, Nashville, TN. "Probing Surface Modification and Electrochemical Cycling Stability of $Li[Ni_{xLi1/3-2x/3}Mn_{2/3-x/3}]O_2$ for Li-ion Batteries by using Advanced Analytical Electron Microscopy" (2011).
- PV School at ORNL-CNMS User Meeting, "Design Of Radial p-n Junction on TiO_2 through N-doping for Solar Applications" (2012)
- University of California, Riverside, "Advanced Analytical Electron Microscopy for Probing Nanostructures" (2010).
- University of California, San Diego, "Advanced Electron Microscopy for Energy Applications" (2011).
- Center for Functional Nanomaterials, Brookhaven National Laboratory, "STEM Analysis of Perovskite Vanadates and Comet Materials" (2008).
- EELS Imaging & Analysis School, Gatan Inc., "An Introduction to EELS Imaging and Analysis" (2008).
- Seagate Inc. R&D Center, CA "Application of STEM/EELS to Semiconductor Materials" (2008).
- Evans Analytical Group, CA "An introduction to EELS in a (S)TEM" (2007).

Meeting Symposia Organized and Committees Served:

- Symposium Organizer "In-situ Characterization of Material Synthesis and Properties at the Nanoscale with TEM," Materials Research Society 2014 Spring Meeting, San Francisco, CA.
- Activity co-organizer at Postdoc Mixer, Microscopy & Microanalysis 2014 Annual Meeting, Hartford, CT.
- Symposium Organizer "Advanced Microscopy Characterizations of Nanoparticles" Microscopy & Microanalysis 2013 Annual Meeting, Indianapolis, IN.
- Pre-meeting Congress Co-Organizer "Artifacts and Interpretation of Aberration-Corrected Electron Microscopy," Microscopy & Microanalysis 2011 Annual Meeting, Nashville, TN.
- Symposium Co-Organizer "A02 Aberration-Corrected Electron Microscopy: Exploring Materials Through New Eyes," Microscopy & Microanalysis 2010 Annual Meeting, Portland, OR.
- Poster Award Committee, Microscopy & Microanalysis 2010 Annual Meeting, Portland, OR.
- *Regular reviewer* for *Nano Letters, Nature Communications, Chemistry of Materials*, *Nano Research*, *ACS Nano*, *Energy & Environmental Sciences* etc.

Graduate Students and Postdoctoral Scholars Supervised:

- Graduate Students: Boyu Liu (XAJU, China); Danna Qian (UCSD, 2014); Minghao Zhang (UCSD, present); Zach Hood (Georgia Tech, present).
- Postdoctoral Scholars: Cheng Ma (ORNL, present); Wenpei Gao (UC-Irvine, present); Qiang Zheng (ORNL, present).

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- Ph.D. Advisor: N.D. Browning, University of California, Davis (Currently at Pacific Northwest National Laboratory) and J. Bradley, Lawrence Livermore National Laboratory (Currently at University of Hawaii).
- M.S. Advisor: H. Gu, Shanghai Institute of Ceramic, Chinese Academy of Sciences, Shanghai, China

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