Marcus D. Lay

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Academic Appointments

2014 - p, Associate Professor, Department of Chemistry, Cooper Union.

2011 - 2014, Associate Professor, Department of Chemistry, University of Georgia.

2005 - 2011, Assistant Professor, Department of Chemistry, University of Georgia.

2007 - 2009, Faculty Science Coordinator for the NSF-funded Louis Stokes Alliance for Minority Participation (LSAMP).

Education

2004 - 2005, Postdoctoral Fellow, Columbia University, Advisor: George W. Flynn, Topic: Utra-High Vacuum Scanning Tunneling Microscopy Studies of Self-Assembled Monolayers.

2003 - 2004, NRC Postdoctoral Fellow, Naval Research Laboratory, Advisor: Eric S. Snow, Topic: Chemical Detection with Single-Walled Carbon Nanotubes.

2003, Ph.D., Chemistry, University of Georgia, Advisor: John L. Stickney, Topic: *In situ* Scanning Tunneling Microscopy Investigations of the Electrodeposition of Compound Semiconductors

1998, B.S., Chemistry, University of Georgia

Teaching

Undergraduate Courses

CH 251	Instrumental Analysis Laboratory, Fall 2014
CH 111	General Chemistry Laboratory, Spring 2015
CHEM 2300	Quantitative Chemical Analysis, Fall 2005, Spring 2007, Spring 2008, Fall 2008, Spring 2009, Spring 2011, Spring 2013
CHEM 2300L	Quantitative Chemical Analysis Laboratory, Fall 2005 - Summer 2011, Spring 2013 - p
CHEM 4330	Nanoscience & Nanotechnology, Spring 2012, Spring 2014
CHEM 3511/L	Experimental Methods Laboratory, Fall 2010

FRESH 1020	Guest Lecturer: The Impact of Underrepresented Minority Scientists on Today's Understanding of Biology, Fall 2010
FRESH 1020	Guest Lecturer: The Frontiers of New Knowledge: An Exploration of Current STEM Research at the University of Georgia presented by the Peach State Louis Stokes Alliance for Minority Participation, Fall 2009

Graduate Courses

CHEM 8880	Nanomaterials: Engineering and Characterization, Fall 2009, Fall 2011, Fall 2012, Fall 2013
CHEM 8890	Special Topics: Nanomaterials, Fall 2007
CHEM 8840	Surface and Thin-Film Analysis, Fall 2006
PHYS 6000	Guest Lecturer: Scanning Probe Microscopy, Fall 2004

Publications in Peer-Reviewed Journals

[#] indicates undergraduate coauthor

1. D. Asheghali, P. Vichchulada, and M. D. Lay, *Conversion of Metallic Single-Walled Carbon Nanotubes to Semiconducting through Electrochemical Ornamentation*, ***J. Am. Chem. Soc.***, 135 (2013) 7511-7522.
2. N. P. Bhatt,[#] P. Vichchulada, and M. D. Lay, *Bulk Purification and Deposition Methods for Selective Enrichment in High Aspect Ratio Single-Walled Carbon Nanotubes*, ***J. Am. Chem. Soc.***, 134 (2012) 9352-9361.
3. Q. Zhang, P. Vichchulada, S.B. Shivareddy, and M. D. Lay, *Reducing Electrical Resistance in Single-Walled Carbon Nanotube Networks: Effect of the Location of Metal Contacts and Low-Temperature Annealing*, ***J. Mat. Sci.***, 47 (2012) 3233-3240.
4. X. Liang, Q. Zhang, M. D. Lay, and J. L. Stickney, *Growth of Ge Nanofilms using Electrochemical Atomic Layer Deposition (E-ALD), with a "Bait and Switch" Surface Limited Reaction*, ***J. Am. Chem. Soc.***, 133 (2011) 8199-8204.
5. L. D. Lipscomb, P. Vichchulada, N. P. Bhatt,[#] Q. Zhang, and M. D. Lay, *Methods for Enhanced Control over the Density and Electrical Properties of SWNT Networks*, ***J. Mat. Sci.***, 46 (2011) 6812-6822.
6. Q. Zhang, P. Vichchulada, and M. D. Lay, *Length and Density Gradients Observed in Spin Cast SWNT Networks*, ***J. Phys. Chem. C***, 114 (2010) 16292-16297.
7. P. Vichchulada, M. A. Cauble,[#] E. Abdi,[#] E. I. Obi,[#] Q. Zhang, and M. D. Lay, *Sonication Power for Length Control of Single-Walled Carbon Nanotubes in Aqueous Suspensions used for 2-Dimensional Network Formation*, ***J. Phys. Chem.*** C, 114 (2010) 12490-12495.
8. Q. Zhang, P. Vichchulada, and M. D. Lay, *Effect of Deposition Conditions on Percolation in Single-Walled Carbon Nanotube Networks*, ***Phys. Status Solidi A*** 207 (2010) 734-738.

9. P. Vichchulada, Q. Zhang, A. Duncan,[#] and M. D. Lay, *Macroscopic Electrical Properties of Ordered SWNT Structures formed with Laminar Flow Deposition*, ***ACS Appl. Mat & Interfaces***, 2 (2010) 467-473.

10. J. Shim, Q. Zhang, P. Vichchulada, and M. D. Lay, *Spectroscopic and Scanning Probe Studies of a Non-destructive Purification Method for SWNT Suspensions*, ***J. Phys. Chem. C***, 114 (2010) 652-657.

11. Q. Zhang, P. Vichchulada, M. Cauble,[#] and M. D. Lay, *Percolation in Aligned Networks of SWNTs formed with Laminar Flow Deposition*, ***J. Mat. Sci.,*** 44 (2009) 1206-1211.

12. P. Vichchulada, D. Vairavapandian, and M. D. Lay, *Mild Method for Bulk Enrichment of High-Aspect Ratio SWNTs*, ***Phys. Status Solidi RRL,*** 3 (2009) 31-33.

13. P. Vichchulada, L. D. Lipscomb, Q. Zhang, and M. D. Lay, *Incorporation of Single-Walled Carbon Nanotubes into Functional Sensor Applications*, ***J. Nanosci. Nanotechnol.***, 9 (2009) 2189-2200 (editorial invitation).

14. P. Vichchulada, J. Shim, and M. D. Lay, *Non-Oxidizing Purification Method for Large Volumes of Long, Undamaged Single-Walled Carbon Nanotubes*, ***J. Phys. Chem. C***, 112 (2008) 19186-19192.

15. D. Vairavapandian, P. Vichchulada, and M. D. Lay, *Preparation and Modification of Carbon Nanotubes: Review of Recent Advances and Applications in Catalysis and Sensing*, ***Anal. Chim. Acta***, 626 (2008) 119-129, (editorial invitation).

16. P. Vichchulada, Q. Zhang, and M. D. Lay, *Recent Progress in Carbon Nanotube Gas Sensors*, ***The Analyst*** (**"Highlight"** article and cover art), 132 (2007) 719-723.

17. M. D. Lay, J. P. Novak, and E. S. Snow, *Simple Route to Large-Scale Ordered Arrays of Liquid Deposited Carbon Nanotubes*, ***Nano Lett.***, 4 (2004) 603-606.

18. E. S. Snow, J. P. Novak, M. D. Lay, and F. K. Perkins, *1/f Noise in Single-walled Carbon Nanotube Devices*, ***Appl. Phys. Lett.***, 85 (2004) 4172-4174.

19. E. S. Snow, J. P. Novak, M. D. Lay, E. H. Houser, F. K. Perkins, and P. M. Campbell, *Carbon Nanotube Networks: Nanomaterial for Macroelectronic Applications*, ***J. Vac. Sci. & Technol. B***, 22 (2004) 1990-1994.

20. J. P. Novak, M. D. Lay, F. K. Perkins, and E. S. Snow, *Carbon Nanotube Networks for Electronics on Polymeric Substrates*, ***Solid State Electron.***, 4 (2004) 1753-1756.

21. M. D. Lay and J. L. Stickney, *Te Atomic Layer Formation from a Basic Solution: Its use in an EC-ALE Cycle for CdTe Formation*, ***J. Electrochem.Soc.***, 151 (2004) C431-C435.

22. M. D. Lay and J. L. Stickney, *Electrodeposition of Au-Cd Alloy Nanostructures on Au(111)*, ***J. Am. Chem. Soc.***, 125 (2003) 1352-1355.

23. M. D. Lay, K. Varazo, and J. L. Stickney**,** *Formation of Sulfur Atomic Layers on Au from Aqueous Solutions of Sulfide and Thiosulfate: Studies using EC-STM, UHV-EC, and TLEC*, ***Langmuir***, 19 (2003) 8416-8427.

24. M. D. Lay and J. L. Stickney, *High-Resolution Electrochemical Scanning Tunneling Microscopy (EC-STM) Flow-cell Studies*, ***J. Phys. Chem. B***, 107 (2003) 10598-10602.

25. M. D. Lay, K. Varazo, N. Srisook, and J. L. Stickney, *Cd Underpotential Deposition (upd) from Sulfate on Au(111): Studies by In- Situ STM and UHV-EC*, ***J. Electroanal.Chem.***, 554-555 (2003) 221-231.

26. B. H. Flowers Jr., T. L. Wade, M. D. Lay, J. W. Garvey, U. Happek, and J. L. Stickney**,** *Atomic Layer Epitaxy of CdTe using an Automated Electrochemical Thin-Layer Flow Deposition Reactor*, ***J. Electroanal.Chem.,*** 524 (2002) 273-285.

27. K. Varazo, M. D. Lay, T. A. Sorenson, and J. L. Stickney, *Formation of the First Monolayers of CdTe on Au(111) by Electrochemical Atomic Layer Epitaxy EC-ALE: Studied by LEED, Auger, XPS, and In-situ STM*, ***J. Electroanal.Chem.***, 522 (2002) 104-114.

Peer-Reviewed Invited Book Chapters

1. P. Vichchulada, L. D. Lipscomb, and M. D. Lay, 2-Dimensional Single-Walled Carbon Nanotube Networks, American Scientific Publishers, **Encyclopedia of Nanoscience and Nanotechnology**, ed. H. S. Nalwa, Volume 25, (2010) 75-89.

2. P. Vichchulada, D. Vairavapandian, and M. D. Lay, Device Structures Composed of Single-Walled Carbon Nanotubes, Oxford University Press, in **Nanoscience and Nanotechnology for Chemical and Biological Defense**, ed. N. Ramanathan, ACS Symposium Series, Volume 1016 (2009) 59-72.

3. K. Varazo, T. L. Wade, B. H. Flowers Jr., M. D. Lay, U. Happek, and John L. Stickney, Morphology in Electrochemical Atomic Epitaxy, **Thin Film Formation, Characterization, and Applications**, eds. Soriaga, Stickney, Bottomley, Kim, Marcel Dekker, Inc., (2002).

4. K. Varazo, L. C. Ward, M. D. Lay, and T. Sorenson, and J. L. Stickney, Compound Semiconductor Formation by Electrochemical Atomic Layer Epitaxy (EC-ALE): Surface Chemistry, in **Encyclopedia of Surface and Colloid Science**, ed. A.T. Hubbard, Marcel Dekker, Inc., Volume 1 (2001) 1129-1161.

Published Abstracts

1. P. Vichchulada and M. D. Lay, Electrochemical studies of carbon nanotube networks. **Abstracts of Papers of the American Chemical Society**, Boston, MA Aug. 19-23, 2007.

2. M. D. Lay and P. Vichchulada, Gas Sensing with liquid deposited carbon nanotube networks. **Abstracts of Papers of the American Chemical Society**, Boston, MA Aug. 19-23, 2007.

3. P. Vichchulada, T. E. Lynch,[#] and M. D. Lay, Electrochemistry of 2D networks of carbon nanotubes. **Abstracts of Papers of the American Chemical Society**, San Francisco, CA Sep. 10-14, 2006.

4. Q. Zhang, P. Vichchulada, and M. D. Lay, Thin-film carbon nanotube network chemical sensors. **Abstracts, 58th Southeast Regional Meeting of the American Chemical Society**, Augusta, GA, Nov. 1-4, 2006.

5. L. D. Lipscomb, T. E. Lynch,# G.W. Book, P. Vichchulada, Q. Zhang, and M.D. Lay, Optimization of thin-film carbon nanotube device geometry. **Abstracts, 58th Southeast Regional Meeting of the American Chemical Society**, Augusta, GA, Nov. 1-4, 2006.

6. T. E. Lynch, # P. Vichchulada, and M. D. Lay, Controlled deposition of 2-dimensional carbon nanotube networks. **Abstracts, 58th Southeast Regional Meeting of the American Chemical Society**, Augusta, GA, Nov. 1-4, 2006.

7. K. Varazo, T. T. Wade, M. D. Lay, U. Happek, and J. L. Stickney, Morphology Evolution in the Formation of CdTe Using Electrochemical Atomic Layer Epitaxy, **Abstracts of Papers of the American Chemical Society** 221: 344-COLL, Part 1 Apr. 1 2001.

8. T. Wade, B. Flowers, K. Varazo, M. D. Lay, U. Happek, and J. L. Stickney, Morphology Control in the Formation of Compound Semiconductors Using Electrochemical Atomic Layer Epitaxy (EC-ALE), Proceedings of the Electrochemical Society, Washington D.C., Mar. 25-29, 2001.

Invited Presentations

1. M. D. Lay, *Purification and Separation of High Aspect Ratio Single-Walled Carbon Nanotubes: Electrical and Electrochemical Properties*, **The Cooper Union for the Advancement of Science and Art**, New York, NY, Mar. 28, 2014.

2. M. D. Lay, *Purification of SWNT Suspensions for Use in the Formation of 2-D Networks/ Teaching Nanoscience in the Undergraduate Curriculum*, **City Technical College**, Brooklyn, NY, Dec. 2, 2013.

3. M. D. Lay, D. Asheghali, N.P., Bhatt, and P. Vichchulada, *Optimizing Networks of Single-Walled Carbon Nanotubes though Electrochemical Methods*, **68st Southwest Regional Meeting of the American Chemical Society**, Baton Rouge, LA, Nov. 4-7, 2012.

4. M. D. Lay, D. Asheghali, N.P. Bhatt, and P. Vichchulada, *Electrochemical Routes to the Reduction of Resistance in Single-Walled Carbon Nanotube Networks*, **Prime 2012, Joint 222nd Meeting of the Electrochemical Society, and The 2012 Fall Meeting of the Electrochemical Society of Japan**, Honolulu, HI, Oct. 7-12, 2012.

5. M. D. Lay and P. Vichchulada, N. P. Bhatt, D. Asheghali, *Enhancing the Electrical Properties of 2-D Single-Walled Carbon Nanotube Networks*, **Federation of Analytical Chemistry and Spectroscopy Societies (FACSS) Presents SCIX2012 Meeting**, Kansas City, MO, Sep. 30-Oct. 5, 2012.

6. C. Parsons and M. D. Lay, *The Promise of Nanoscience*, **General Body Meeting of the Student Affiliates of the American Chemical Society at the University of Georgia,** Athens, GA, Oct. 1, 2012.

7. M. D. Lay, *Purification of SWNT Suspensions for Use in the Formation of 2-D Networks*, **Virginia Commonwealth University**, Richmond, VA, Sept. 13, 2012.

8. M. D. Lay, P. Vichchulada, and D. Asheghali, *Electrochemical Routes to the Reduction of Resistance in Single-Walled Carbon Nanotube Networks*. **American Chemical Society Meeting**, San Diego, CA, Mar. 25-29, 2012.

9. M. D. Lay, *Purification of SWNT Suspensions for Use in the Formation of 2-D Networks*, **The University of Memphis**, Memphis, TN, Oct. 17, 2011.

10. M. D. Lay, P. Vichchulada, N. P. Bhatt, [#] D. Stanley, and S. Shivareddy, *Single-Walled Carbon Nanotubes: Purification, Network Formation and Optimization of Electronic Properties*, **Columbia University NSEC Symposium**, New York, NY, June 11, 2011.

11. M. D. Lay, *Purification of SWNT Suspensions for Use in the Formation of 2-D Networks*, **University of Alabama**, Tuscaloosa, AL, Nov. 4, 2010.

12. M. D. Lay, *Preparation of SWNT Suspensions for use in DNA Binding Studies*, **Nanomedicine 2010: Integrative Nanotechnology for Biomedicine,** Beijing, China, Oct. 23-25, 2010**.**

13. M. D. Lay, P. Vichchulada, Q. Zhang, Meagan Cauble,[#] and Jihye Shim, *Single-Walled Carbon Nanotubes: Purification, Network Formation and Electronic Studies,* **NSF Funded 3rd US-China Workshop on Nanostructured Materials for Global Energy and Environmental Challenges,** Beijing, China, Sep. 20-22, 2010.

14. M. D. Lay, *Purification of SWNT Suspensions for Use in the Formation of 2-D Networks*, **University of Georgia**, Athens GA, Aug. 9, 2010.

15. M. D. Lay, *Purification of SWNT Suspensions for Use in the Formation of 2-D Networks*, **University of Florida**, Gainesville, FL, Mar. 30, 2010.

16. **Plenary Lecture:** M. D. Lay, *Room Temperature Deposited Carbon Nanotube Networks*, **3rd Thailand Nanotechnology Conference: Health, Energy, Environment**, Bangkok, Thailand, Dec. 21-22, 2009.

17. M. D. Lay, *Purification of SWNT soot for Deposition of 2-D Networks*, **Auburn University**, Auburn AL, Nov. 19, 2009.

18. M. D. Lay, Q. Zhang, P. Vichchulada, and M. A. Cauble, [#] *Purification of SWNT Suspensions and Formation of 2-D Networks of Single-Walled Carbon Nanotubes*, **61st Southeast Regional Meeting of the American Chemical Society**, San Juan, Puerto Rico, Oct. 21-24, 2009.

19. M. D. Lay, *Electronic Applications of 2-Dimensional Networks of Carbon Nanotubes*, **Clemson University**, Clemson, SC, Oct.1, 2009.

20. M. D. Lay, D. Vairavapandian and P. Vichchulada, *Electronic Applications of 2-Dimensional Networks of Carbon Nanotubes*, **213th Electrochemical Society (ECS) Meeting**, Phoenix, AZ, May 18-22, 2008.

21. **Travel Award:** D. Vairavapandian and **M. D. Lay**, *Electrodeposition of Pt Nanoparticles on Low-Density SWNT Networks*, **213th Electrochemical Society (ECS) Meeting**, Phoenix, AZ, May 18-22, 2008.

22. M. D. Lay, *Electronic Applications of 2-D networks of SWNTs*, **University of South Carolina at Columbia,** SC, Feb. 18, 2008, (Departmental Colloquium).

23. M. D. Lay and P. Vichchulada, *Percolative transport in 2-D Networks of SWNTs*, **University of Louisville,** Louisville, KY, Nov. 9, 2007.

24. M. D. Lay, *Nanotechnology: Changing the World One Atom at a Time / 2-D Networks of SWNTs as an Electronic Material*, **Tennessee Tech. University**, Cookeville, TN, Nov. 8, 2007, (Departmental Colloquium).

25. M. D. Lay, *Electronic Applications of 2-D Networks of SWNTs*, **University of North Carolina at Charlotte**, NC, Nov. 1, 2007, (Departmental Colloquium).

26. M. D. Lay and P. Vichchulada, *2-D Networks of SWNTs as an Electronic Material*, **Western Carolina University**, Cullowhee, NC, Sep. 28, 2007, (Departmental Colloquium).

27. M. D. Lay and P. Vichchulada, *Investigations of Ordered 2-D Networks of Carbon Nanotubes*, **The International Society for Optical Engineering** (**SPIE)**, San Diego, CA Aug. 26-30, 2007.

28. M. D. Lay and P. Vichchulada, *Applications of Ordered 2-D Networks of Carbon Nanotubes*, **American Chemical Society (ACS)**, Boston, MA, Aug. 19-23, 2007.

29. M. D. Lay, *Carbon Nanotube Networks*, **NSF Funded World Technology Evaluation Center (WTEC) Workshop on Building Electronic Function into Molecular Architectures**, Marymount University Conference Center, June 7-8, 2007.

30. Q. Zhang, P. Vichchulada, L. D. Lipscomb, and M.D. Lay, *Applications of SWNT Networks*, **Tsinghua University**, Beijing, China, May 29, 2007.

31. M. D. Lay and P.Vichchulada, *Electrochemical Deposition of Quantum Confined Materials on Single-Walled Carbon Nanotube Templates*, **211th Electrochemical Society (ECS) Meeting**, Chicago, IL, May 6-11 2007.

32. M. D. Lay and P. Vichchulada, *Novel Applications of 2-Dimensional Carbon Nanotube Networks*, **Joint Meeting of the National Society of Black Physicists and National Society of Latino Physicists (NSBP & NSLP)**, Boston, MA, Feb. 21-25, 2007.

33. M. D. Lay and P. Vichchulada, *Electronic Applications of Enhanced Molecular-Scale Materials*, **Gordon Research Conference on Electrochemistry**, Ventura, CA, Jan. 4, 2007.

34. **Travel Award:** M. D. Lay and P. Vichchulada, *Novel Applications of 2-Dimensional Carbon Nanotube Networks*, **Federation of Analytical Chemistry and Spectroscopy Societie**s **(FACSS) Meeting**, Lake Buena Vista, FL, Sep. 24-28, 2006.

35. M. D. Lay, *Nanotechnology: Changing the World One Atom at a Time*, **Francis Marion University**, Florence, SC, Apr. 6, 2006, (Departmental Colloquium).

36. M. D. Lay, M. C. Nuckolls and G. W. Flynn, *Surface Studies of Enhanced Metal/Carbene Contacts*, **American Physical Society Meeting**, Baltimore, MD, Mar. 13-17, 2006.

37. M. D. Lay, *Controlled Synthesis of Nano-Materials*, **University of Maryland**, College Park, MD, Feb. 16, 2005.

38. M. D. Lay, *Controlled Synthesis of Nano-Materials*, **Hunter College**, New York, NY, Feb. 10, 2005.

39. M. D. Lay, *Controlled Synthesis of Nano-Materials*, **Rensselaer Polytechnic Institute**, Troy, NY, Feb. 2, 2005.

40. M. D. Lay, *Controlled Synthesis of Nano-Materials*, **Louisiana State University**, Baton Rouge, LA, Jan. 31, 2005.

41. M. D. Lay, *Controlled Synthesis of Nano-Materials*, **University of Georgia**, Athens, GA, Jan. 13, 2005.

42. M. D. Lay, *Controlled Synthesis of Nano-Materials*, **Georgia Institute of Technology**, Atlanta, GA, Jan. 11, 2005.

43. M. D. Lay, *Controlled Synthesis of Nano-Materials*, **Tufts University**, Boston, MA, Dec. 13, 2004.

44. M. D. Lay, *Controlled Synthesis of Nano-Materials*, **Purdue University**, West Lafayette, IN, Dec. 6, 2004.

45. M. D. Lay, *Atomic-Level Studies of Electrochemical Reactions Used in Compound Semiconductor Formation*, **Columbia University**, New York, NY, Mar. 5, 2004.

46. J. P. Novak, M. D. Lay, F. K. Perkins and E. S. Snow, *Single-Walled C Nanotube Networks: A Nanomaterial for Macroelectronic Applications on Flexible Substrates*, **International Semiconductor Device Research Symposium**, Washington, D.C., Dec. 10-12, 2003.

47. J. L. Stickney, **M. D. Lay** and N. Srisook, *Studies of the Deposition of the First Few Monolayers of CdTe and CdSe on Au(111), via Electrochemical Atomic Layer Epitaxy (EC-ALE)*, **Electrochemical Society Meeting**, Orlando, FL, Oct. 12-17, 2003.

48. M. D. Lay, *Atomic Level Studies of Electrochemical Reactions Used in EC-ALE*, **Naval Research Laboratory**, Washington, D.C., May 15, 2003.

49. J. L. Stickney and M. D. Lay, *Surface Studies of Atomic Layers Formed in the Electrodeposition of Compound Semiconductors using EC-ALE*, **Electrochemical Society Meeting**, Paris, France, Apr. 27-May 2, 2003.

50. M. D. Lay, *In-Situ Scanning Tunneling Microscopy Studies of Electrochemical Atomic Layer Epitaxy: Te, Cd, S, and Flow Cell Studies of CdTe*, **Tohoku University**, Sendai, Japan, Jan. 20, 2003.

51. M. D. Lay and J. L. Stickney, *In-Situ Scanning Tunneling Microscopy Studies of Electrochemical Atomic Layer Epitaxy: Te, Cd, S, and Flow Cell Studies of CdTe*, **Electrochemical Society Meeting**, Philadelphia, PA, Mar. 12-17, 2002.

Invitations to Workshops

1. *Third US-China Workshop on Nanostructured Materials for Global Energy and Environmental Challenges***,** Beijing, China, Sep. 20-22, 2010.
2. *NSF Funded World Technology Evaluation Center (WTEC) Workshop on Building Electronic Function into Molecular Architectures*, Marymount University Conference Center, June 7-8, 2007.

Symposia Organized and Sessions Chaired at National Meetings

1. Technical Symposium Organizer: *Novel 2D Materials*, **American Vacuum Society (AVS) 62nd International Symposium and Exhibition**, San Jose, CA, Oct. 18-23, 2015.
2. Session Chair: *Electronic Materials and Devices*, **International Union of Materials Research Societies - International Conference on Electronic Materials 2012 (IUMRS-ICEM)**, Yokohama, Japan, Sep. 23-28, 2012.
3. Session Chair: *Novel Optical Reporters, Dyes and Tags in Molecular and Raman Spectroscopy*, **Federation of Analytical Chemistry and Spectroscopy Societie**s **(FACSS) Presents SCIX2012 Meeting**, Kansas City, MO, Sep. 30-Oct. 5, 2012.
4. Technical Symposium Organizer: Nanostructured Electronic Materials, **American Chemical Society National Meeting and Exposition**, San Diego, CA, Mar. 25-29, 2012.
5. Session Chair: Nanotechnoloy for Energy Applications, **3rd Thailand Nanotechnology Conference: Health, Energy, Environment,** Bangkok, Thailand, Dec. 21-22, 2009.
6. Technical Symposium Organizer: Electrodeposition for Energy Applications, **213th Electrochemical Society (ECS) Meeting**, Phoenix, AZ, May 18-22, 2008.
7. Poster Session Chair: *Electrodeposition for Energy Applications*, **213th Electrochemical Society (ECS) Meeting**, Phoenix, AZ, May 18-22, 2008.
8. Session Organizer: Electrodeposition for Energy Applications: Young Investigators, Nanoscale Materials, **213th Electrochemical Society (ECS) Meeting**, Phoenix, AZ, May 18-22, 2008.
9. Session Chair: Electrodeposition for Energy Applications: Young Investigators, Nanoscale Materials, **213th Electrochemical Society (ECS) Meeting**, Phoenix, AZ, May 18-22, 2008.
10. Session Chair: Surfaces and Interfaces in Electronic Materials II, **American Physical Society National Meeting**, Baltimore, MD, Mar. 2006.

Contributed Presentations

[#] indicates undergraduate coauthor

1. M. A. Plott,[#] P. Vichchulada, and M.D. Lay, *Use of Sonication Power to Control Length Distributions of SWNTs in Aqueous Suspensions for Network Formation*, **Southern**

Undergraduate Research Conference (SURC), Knoxville, TN, Nov. 1-2, 2013 (Honorable Mention in poster competition).

2. N. P. Bhatt, P. Vichchulada, and M. D. Lay, *Facile Route to the Purification and Separation of High Aspect Ratio Single-Walled Carbon Nanotubes*, **Federation of Analytical Chemistry and Spectroscopy Societie**s **(FACSS) Presents SCIX2012 Meeting**, Kansas City, MO, Sep. 30-Oct. 5, 2012.

3. D. Asheghali, P. Vichchulada, and M. D. Lay, *Reduction of Electrical Resistance in CarbonNanotube Networks through Electrochemical Nanowelding*, **Federation of Analytical Chemistry and Spectroscopy Societie**s **(FACSS) Presents SCIX2012 Meeting**, Kansas City, MO, Sep. 30-Oct. 5, 2012.

4. **Travel Assistance**: M. D. Lay, *Facile Route to the Purification and Separation of High Aspect Ratio Single-Walled Carbon Nanotubes*, **International Union of Materials Research Societies - International Conference on Electronic Materials 2012 (IUMRS-ICEM)**, Yokohama, Japan, Sep. 23-28, 2012. (Served as presentation judge for Young Scientist / Gold Award).

5. P. Vichchulada, and **M. D. Lay**, *Electrochemical Spot-Welding for the Reduction of Resistance in 2D Single-Walled Carbon Nanotube Networks*. **American Chemical Society Meeting**, San Diego, CA, Mar. 25-29, 2012.

6. M. A. Cauble[#] and M.D. Lay, *Characterization and Detection of Non-Covalent Binding of Single-Stranded Oligonucleotides to Single Walled Carbon Nanotubes*, **Federation of Analytical Chemistry and Spectroscopy Societies (FACSS) Meeting**, Raleigh, NC, Oct. 17-21, 2010.

7. M. A. Cauble,[#] P. Vichchulada, J. Shim, and M.D. Lay, *Use of Sonication Power to Control Length Distributions of SWNTs in Aqueous Suspensions for Network Formation*, **Federation of Analytical Chemistry and Spectroscopy Societies (FACSS) Meeting**, Raleigh, NC, Oct. 17-21, 2010 (1st Place in the poster competition).

8. Q. Zhang and M.D. Lay, *Application of Percolation Theory to the Electronic Behavior of Single-Walled Carbon Nanotube (SWNT) Networks Deposited via Laminar-Flow Deposition*, **PittCon Conference and Expo 2010**, Orlando, FL, Feb. 28-Mar. 5, 2010.

9. M. A. Cauble,[#] P. Vichchulada, Q. Zhang, and M.D. Lay, *Dispersion of Single-Walled Carbon Nanotubes in Aqueous Solution*, **PittCon Conference and Expo 2010**, Orlando, FL, Feb. 28-Mar. 5, 2010.

10. S. Dunn[#] and M.D. Lay, *Methods for Purification of SWNTs suspensions),* **Peach State Louis Stokes Alliance for Minority Participation (PSLSAMP) Third Annual Fall Research Conference**, Savannah, GA Nov. 18, 2008.

11. P. Vichchulada and **M. D. Lay**, *Development of Methods for the Deposition of Ordered Carbon Nanotube Networks*, **213th Electrochemical Society (ECS) Meeting**, Phoenix, AZ, May 18-22, 2008.

12. E. Abdi,[#] K. Kenner,[#] P. Vichchulada, D. Vairavapandian, Q. Zhang and **M. D. Lay**, *Developing a Protocol for Homogenizing Carbon Nanotubes in Aqueous Solution*, **Peach**

State Louis Stokes Alliance for Minority Participation (PSLSAMP) Second Annual Fall Research Conference, Athens, GA, Sep. 21, 2007, (1st Place in the undergraduate poster competition).

13. Q. Zhang and **M. D. Lay**, *Carbon Nanotube Network Sensors*. **6th Annual Georgia Graduate Student Interdisciplinary Conference (CGSIC)**, Mar. 24, 2007.

14. L. D. Lipscomb and **M. D. Lay**, Patterning carbon nanotube networks. **6th Annual Georgia Graduate Student Interdisciplinary Conference (CGSIC)**, Mar. 24, 2007.

15. **M. D. Lay** and P. Vichchulada, *Investigations of 2-Dimensional Carbon Nanotube Networks*. **American Physical Society Meeting**, Denver, CO, Mar. 5-9, 2007.

16. Q. Zhang, P. Vichchulada, and **M.D. Lay**, *Thin-Film Carbon Nanotube Network Chemical Sensors*. **58th Southeast Regional Meeting of the American Chemical Society**, Augusta, GA, Nov. 1-4, 2006.

17. T. E. Lynch,# P. Vichchulada, and **M. D. Lay**, *Controlled Deposition of 2-Dimensional Carbon Nanotube Networks*. **58th Southeast Regional Meeting of the American Chemical Society**, Augusta, GA, Nov. 1-4, 2006.

18. L. D. Lipscomb and **M.D. Lay,** *Carbon Nanotube Device Optimization*, **Procter and Gamble Chemical Sciences Research Retreat**, University of Georgia, Athens, GA, Oct. 27, 2006.

19. Q. Zhang, P. Vichchulada, and **M.D. Lay**, *Carbon Nanotube Gas Sensors*, **Procter and Gamble Poster Competition**, University of Georgia, Oct. 27, 2006.

20. P. Vichchulada, T.E. Lynch,# and **M. D. Lay**, *Applications of Ordered 2-D Networks of Carbon Nanotubes*. **American Chemical Society Meeting**, San Francisco, CA, Sep. 10-14, 2006.

21. P. Vichchulada, T.E. Lynch,# and **M. D. Lay**, *Applications of 2-Dimensional Carbon Nanotube Networks*. **Federation of Analytical Chemistry and Spectroscopy Societie**s **Meeting**, Lake Buena Vista, FL, Sep. 26, 2006.

22. **M. D. Lay**, P. Vichchulada, and T.E. Lynch,# *Applications of Ordered 2-D Networks of Carbon Nanotubes*. **American Chemical Society National Meeting and Exposition**, San Francisco, CA, Sep. 10-14, 2006.

23. **M. D. Lay**, *Studies of Nano-scale Systems with Electronics Applications*. Academic Employment Initiative, **American Chemical Society National Meeting and Exposition**, Philadelphia, PA, Aug. 22-26, 2004.

24. **M. D. Lay**, *Studies of Nano-Scale Systems with Electronics Applications*. Fundamental Research in Surface and Colloid Chemistry, **American Chemical Society National Meeting and Exposition**, Philadelphia, PA, Aug. 22-26, 2004.

25. **M. D. Lay**, Kris Varazo, N. Srisook, and J. L. Stickney, *Surface Studies of Atomic Layers used in Electrochemical Atomic Layer Epitaxy: Cd, Te and Flow-Cell ECSTM of CdTe*. **Procter and Gamble Chemical Sciences Research Retreat**, University of Georgia, Athens, GA, Sep. 2002.

26. **M. D. Lay**, K. Varazo, N. Srisook, and J. L. Stickney, *Surface Studies of Atomic Layers used in Electrochemical Atomic Layer Epitaxy: Cd, Te and Flow-Cell EC-STM of CdTe*. **Gordon Conference on Electrodeposition**, New London, NH, Aug. 2002.

27. M. Muthuvel and **M. D. Lay**, *Anion Effects in the Underpotential Deposition of Cd on Au(111), and Formation of the First Monolayers of CdTe, using: AES, XPS, LEED and STM*. **Electrochemical Society National Meeting**, Philadelphia, PA, Mar. 12-17, 2002.

28. **M. D. Lay** and J. L. Stickney, *The Formation and Characterization of Cadmium Telluride on Au(111) by In-Situ STM*. **Procter and Gamble Chemical Sciences Research Retreat**, University of Georgia, Athens, GA, Nov. 2001.

29. K. Varazo, **M. D. Lay**, T. A. Sorenson, U. Happek, and J. L. Stickney, *Morphology Evolution in the Formation of CdTe using Electrochemical Atomic Layer Epitaxy (EC-ALE).* **Electrochemical Society National Meeting**, Washington D.C., Mar. 25-29, 2001.

30. K. Varazo, **M. D. Lay**, T. A. Sorenson, and J. L. Stickney, *Surface Studies of Cadmium Underpotential Deposition on Au(111) from Sulfate and Chloride Containing Solutions*. First place in the **Procter and Gamble Chemical Sciences Research Retreat**, University of Georgia, Athens, GA, Sep. 2000.

31. T. A. Sorenson, **M. D. Lay**, and J. L. Stickney, *Surface Studies of Tellurium Deposition on Au(111)*. **Gordon Conference on Electrodeposition**, New London, NH, Aug. 2000.

32. K. Varazo, T. A. Sorenson, **M. D. Lay**, W. Balsanek, and John L. Stickney, *Low Energy Electron Diffraction and Auger Electron Spectroscopy Studies of CdTe formation on Au(111) by Electrochemical ALE*. **Georgia Local Section of the Electrochemical Society Spring Meeting**, Atlanta, GA, May 2000.

33. K. Varazo, **M. D. Lay**, and T. A. Sorenson, *A UHV Study of Cd Electrodeposition*. **Procter and Gamble Chemical Sciences Research Retreat**, University of Georgia, Athens, GA, Nov. 2000.

34. K. Varazo, T. A. Sorenson, W. D. Suggs, **M. D. Lay**, and J. L. Stickney, *Characterization of Tellurium Atomic Layers by Cyclic Voltammetry, Auger Electron Spectroscopy and Low Energy Electron Diffraction*. **Procter and Gamble Chemical Sciences Research Retreat**, University of Georgia, Athens, GA, Sep. 1999.

Undergraduate, Graduate and Postdoctoral Advisees

Postdoctoral Scientists: Dr. Zhihong Lin (Postdoc., 2005-2006), currently at Johns Hopkins Medical School, Dr. Pornnipa Vichchulada (Postdoc., 2010 to 2012), currently at Cooper Union.

Graduate Students: Jihye Shim (Ph.D., 2009, Merk Advanced Tech.), Deepa Vairavapandian (Ph.D., 2009, Brown U.), Pornnipa Vichchulada (Ph.D., 2010, UGA), Qinghui Zhang (Ph.D., 2010, China National Space Administration), Leonard Lipscomb (Ph.D., 2010, Gainesville State U.), Dovie Stanley (Ph.D., 2010-p), Nidhi Bhatt (Ph.D., 2011-p), Chris Parsons (B.S./M.S., 2011-2013).

Undergraduate Students: Tasaday Lynch (SURO, 2006-2007), Karren Kenner, (LSAMP, 2006-2008), Egal Abdi, (LSAMP, 2006-2008), Sevena Scott (2007-2009), Emmanuel Obi (2007-2011), Scott Davichick (2007-2008), Philipp Kozan (SURO, 2007), Shanon Dunn, (LSAMP, 2007-2009), Alicia Duncan (2007-2008), James Winters (2008-2010), Meagan Cauble (Barry M. Goldwater Scholar, Northeast Georgia Section of the American Chemical Society's Student of the Year Award, Honors Student, CURO, SURO (2007-2011), Nidhi Baht (2009-2011), Benard Villegas (2009-2011), Julian Rios (2010-p), Teyana Gainey (2010-2011), Orrett Walker (2011), Chris Parsons (2011-2012), Sean Young (2011-2012), Woolim Kwon (2011-2012), James Liu (2011-2012), Alisha Drummer (2012), Melina Truong (2011-2013), Megan Do (2011-2013), Matthew Plott (2011-2014).

Honors and Awards

1. Undergraduate mentee won Honorable Mention, Physical Chemistry Division, in poster competition at **Southern Undergraduate Research Conference (SURC)**, Knoxville, TN, Jan.31st, 2014.
2. Recognition from UGA's Career Center for contributing to the career development of undergraduates, May 2010, May, 2012, May 2013, May 2014.
3. Undergraduate mentee won the Northeast Georgia Section of the American Chemical Society Student of the Year Award, Apr. 2011.
4. Undergraduate mentee won the Barry M. Goldwater Scholarship and Excellence in Education Program Award in a national competition ($7,500), Apr. 2010.
5. Undergraduate mentee won 1st place in poster competition at **Federation of Analytical Chemistry and Spectroscopy Societies (FACSS)**, Raleigh, NC, Oct. 17-21, 2010.
6. Graduate mentees won University of Georgia Outstanding Teaching Assistant Award (2010, 2013, 2014).
7. Presented a Plenary Lecture at the 3rd Thailand Nanotechnology Conference: Health, Energy, Environment, Dec. 2009.
8. Undergraduate mentee won the University of Georgia's Student Employee of the Year award (2009).
9. Travel Award, 213th Electrochemical Society (ECS) Meeting, May 2008.
10. Two undergraduate mentees won 1st Place in the undergraduate poster competition at the Peach State Louis Stokes Alliance for Minority Participation's (**PSLSAMP**) 2nd Annual Fall Research Conference (2007).
11. Graduate mentees have won the UGA Department of Chemistry's Outstanding Teaching Assistant Award a total of 11 times.

Grants and Contracts

1. **National Science Foundation** (PI: McElwee-White; Senior Investigators: Girolami, Lay, Lyding and Wei) *Center for Nanostructured Electronic Materials,* $1,500,000; $292,000 to Lay.

2. **University of Georgia Research Foundation** (PI: Lay), *Electrochemical Characterization of Carbon Nanotube Networks*, $20,000.

3. **National Science Foundation** (PI: Lay), *Macroscopic Electronic and Electrochemical Properties of Networks of Purified SWNTs*, $564,036.

4. **University of Georgia Research Foundation** (PI: Lay), *Electrochemical Characterization of Carbon Nanotube Networks*, $15,000.

5. **National Science Foundation** (Co-PIs: Adams, Anderson, Grasso, Garfield, Dozier, Parker), *LSAMP - Peach State Louis Stokes Alliance for Minority Participation*, $5,000,000; $3,000 to Lay.

6. **University of Georgia Research Foundation** (PI: Lay), *New Room-Temperature Method for Deposition of Carbon Nanotube Networks*, $10,000.

Professional Activities and Services

1. Reviewer for peer-reviewed journals: *Journal of Physical Chemistry C, Langmuir, Nano Letters, ACS Nano, Journal of the American Chemical Society, Applied Surface Science, Chemistry of Materials, Inorganic Chem., Electrochemical and Solid-State Letters, Physica Status Solidi, Physica Status Solidi Rapid Research Letters, Materials Chemistry and Physics, Journal of Electronic Materials, Scanning, Carbon, Microscopy Research and Technique, Chemistry-A European Journal, Chemical Physics Letters, Materials Chemistry and Physics, Materials Chemistry and Physics, Analytical Letters, Sensors, Chemistry - An Asian Journal, and IEEE Transactions on Nanotechnology.*

2. Review panel member the National Science Foundation: *Major Research Instrumentation Acquisition, Materials World Network, Electronic and Photonic Materials,* and *Division of Design and Manufacturing*.

3. Ad hoc reviewer for proposals: National Science Foundation: *Division of Materials Research, Division of Chemistry*, and *Nanomanufacturing Division.* Department of Defense: *Army Research Office,* Ontario Ministry of Research and Innovation: *Research Excellence Program*.

4. Served as presentation judge for Young Scientist / Gold Award, at International Union of Materials Research Societies - International Conference on Electronic Materials 2012 (IUMRS-ICEM), Yokohama, Japan, Sep. 23-28, 2012.

5. Undergraduate textbook reviewer: "Physical Chemistry at the Microscopic Scale: Quantum Chemistry and Molecular Interactions" by Andrew Cooksy, Pearson, 2012.

6. Undergraduate textbook reviewer: "Understanding Nanomaterials" by Mal Johal and Bob Rawl, CRC Press, 2011.

7. Invited to participate and give a talk at the NSF funded "Building Electronic Function into Nanoscale Molecular Architectures" workshop for deciding the future direction of NSF funding in nanoscience, June 7-8, 2007.

Current Professional Affiliations

1. Member, American Chemical Society (ACS).
2. Member, Electrochemical Society (ECS).