CURRICULUM VITAE

Name: Gregory L. Griffin

Education:

B.S. California Institute of Technology, 1975
Chemical Engineering
Ph.D. Princeton University, 1979
Chemical Engineering

Positions held:

1998 - present	George H. Nusloch II Endowed Professor Department of Chemical Engineering Louisiana State University Baton Rouge, LA 70803
1992 - 1998	Professor (ibid)
1987 - 1992	Associate Professor (ibid)
1980 - 1987	Assistant Professor Department of Chemical Engineering and Materials Science University of Minnesota
1979 - 1980	National Research Council Postdoctoral Fellow Surface Science Division National Bureau of Standards

Research activities:

Chemical vapor deposition processes
- Copper thin film interconnects
- Titanium dioxide dielectric films
- Aluminum nitride aerosol synthesis

Materials characterization
- Electron Microscopy
- Surface Analytical Techniques
- Vibrational Spectroscopy

Heterogeneous catalysis
- CO_2 reduction
- Methanol synthesis
- Photo-assisted catalysis

Professional societies:

American Chemical Society
American Institute of Chemical Engineers
Electrochemical Society
Materials Research Society

Publications - Gregory L. Griffin

1. "Microscopic Capillarity Approximation: Free Energies of Small Clusters", with R. P. Andres; *J. Chem. Phys.*, **71**, 2522-2530 (1979).

2. "Thermal Desorption Spectroscopy for High-Specific Area Solids: Hydrocarbon Adsorption and Diffusion in NaX Zeolite Crystals", with M. Kiskinova and J.T. Yates, Jr.; *J. Catal.*, **71**, 278-287 (1981).

3. "Combined Temperature Programmed Desorption and IR Study of H_2 Chemisorption on ZnO", with J.T. Yates, Jr.; *J. Catal.*, **73**, 395-405 (1982).

4. "Configurational Effects in the Adsorption of HD on ZnO", with J.T. Yates, Jr.; *Chem. Phys. Lett.*, **87**, 201-203 (1982).

5. "Adsorption of H_2 Isotopes on ZnO: Coverage Induced IR Frequency Shifts and Adsorbate Geometry", with J.T. Yates, Jr.; *J. Chem. Phys.*, **77**, 3744-3750 (1982).

6. "Co-adsorption Studies of CO and H_2 on ZnO"; with J.T. Yates, Jr.; *J. Chem. Phys.*, **77**, 3751-3758 (1982).

7. "Temperature Programmed Desorption from Porous Catalysts: Langmuir Adsorption"; with D. Jones; *J. Catal.*, **80**, 40-46 (1983).

8. "A Simple Phase Transition Model for Metal Passivation Kinetics"; *J. Electrochem. Soc.*, **131**, 18-21 (1983).

9. "Adsorption Behavior of Cu Species in Cu/ZnO Methanol Synthesis Catalysts", with D.L. Roberts; *Appl. of Surf. Sci.*, **19**, 298-306 (1984).

10. "Temperature Programmed Desorption Studies of Hydrogen on Zn(0001) Surfaces", with L. Chan; *Surf. Sci.*, **145**, 185-196 (1984).

11. "Photo-Assisted Oxidation of Methanol on Molybdena/TiO_2 Catalysts: Catalyst Morphology and Reaction Mechanism", with Y.C. Liu, S.S. Chan, and I.E. Wachs; *J. Catal.*, **94**, 108-119 (1985).

12. "Initial Oxidation of Zn(0001) Surfaces: H_2 Adsorption and XPS Studies", with L. Chan; *J. Vacuum Sci. Technol.*, **A3**, 1613-1617 (1985).

13. "Methanol Decomposition on Oriented ZnO Thin Films", with L. Chan; *Surf. Sci.*, **155**, 400-412 (1985).

14. "Combined Infrared and Programmed Desorption Study of Methanol Decomposition on ZnO", with D.L. Roberts; *J. Catal.*, **95**, 617-620 (1985).

15. "Methanol Decomposition on Cu/ZnO Oriented Thin Films", with L. Chan; *Surf. Sci.*, **173**, 160-175 (1985).

16. "The Cation Monolayer Model for Metal Passivation: II. Kinetics of the Active-Passive Transition", *J. Electrochem. Soc.*, **133**, 1315-1320 (1986).

17. "Infrared Reflectance Absorbance Spectroscopy of Co-adsorbed CO and H_2O on Pt(111) Surfaces", with W.J. Tornquist; *J. Vac. Sci. Technol.*, **A4**, 1437-1441 (1986).

18. "On the Role of Specific Hydrogen Adsorption Sites in Methanol Decomposition on Zinc Oxide", with D.L. Roberts; *J. Catal.*, **101**, 201-211 (1986).

19. "Photo-oxidation of Methanol Using V_2O_5/TiO_2 and MoO_3/TiO_2 Surface Oxide Monolayer Catalysts", with T. Carlson; *J. Phys. Chem.*, **90**, 5896-5900 (1986).

20. "Formaldehyde Conversion to Methanol and Methyl Formate on Copper/Zinc Oxide Catalysts", with L.L. Mueller; *J. Catal.*, **105**, 352-358 (1987).

21. "Vibrational Behavior of Carbon Monoxide Adsorbed on Platinum in Non-Acidic Media", with W.J. Tornquist and F. Guillaume; *Langmuir*, **3**, 477-483 (1987).

22. "Product Selectivity During CH_3OH Decomposition on TiO_2 Powders", with E.A. Taylor; *J. Phys. Chem.*, **92**, 477-481 (1988).

23. "Temperature Programmed Desorption and Infrared Study of CO and H_2 Adsorption on Cu/ZnO Catalysts", with D.L. Roberts; *J. Catal.*, **110**, 117-126 (1988).

24. "Methanol Synthesis Activity of Cu/ZnO Catalysts", with W.X. Pan, R. Cao, and D.L. Roberts; *J. Catal.*, **114**, 440-446 (1988).

25. "Vibrational Spectroscopic Studies of Adsorbate Competition during CO Adsorption on Pt Electrodes", with R.R. Rodriguez, W.J. Tornquist, and F. Guillaume; in Molecular Phenomena at Electrode Surfaces; M.P. Soriaga, Ed.; ACS Symposium Series No. 378, Americal Chemical Society, Washington, D.C. (1988) p. 369-382.

26. "Selectivity Control During the Photo-Assisted Oxidation of 1-Butanol on Titanium Dioxide", with N.R. Blake; *J. Phys. Chem.*, **92**, 5697-5701 (1988).

27. "Direct Synthesis of Higher Alcohols Using Bimetallic Copper/Cobalt Catalysts", with R.Cao and W.X. Pan; *Langmuir*, **4**, 1108-1112 (1988).

28. "Direct Alcohol Synthesis Using Copper/Cobalt Catalysts", with W.X. Pan and R. Cao; *J. Catal.*, **114**, 447-456 (1988).

29. "Chemical Reactions of Zn/Cu, Zn/Cu_2O, and Zn/CuO Thin Films", with K.L. Siefering; *Surf. Sci.*, **207**, 525-538 (1989).

30. "In-situ Spectroscopy of Multilayer CuSCN Films on Cu Electrodes", with F. Guillaume; *Langmuir*, **5**, 783-787 (1989).

31. "Chemical Vapor Deposition of Vanadium Oxide Thin Films", with K.L. Siefering; *J. Electrochem. Soc.*, **136**, 897-898 (1989).

32. "Kinetics of Chemical Vapor Deposition of TiO_2 from Titanium Tetraisopropoxide", with K.L. Siefering; *J. Electrochem. Soc.*, **137**, 814-818 (1990).

33. "Growth Kinetics of CVD TiO_2: Influence of Carrier Gas", with K.L. Siefering; *J. Electrochem. Soc.*, **137**, 1206-1208 (1990).

34. "Kinetics of CVD Growth of TiO_2 via Decomposition of Tetra-Isopropyl Orthotitanate", with Siefering, K. L.; in Ceramic Thin and Thick Films; (Hiremath, B. V., ed.); Ceram. Trans. Vol. 11, 219-230; (American Ceramic Society; Westerville, Ohio) 1990.

35. "Aerosol Reactor Design for Aluminum Nitride Powder Synthesis"; with Adjaottor, A. A.; in Ceramic Powder Science III; (Messing, G. L.; Hirano, S.; Hausner, H.; eds.); Ceram. Trans., Vol. 12, 299-304; (American Ceramic Society; Westerville, Ohio) 1990.

36. "Deposition Kinetics of CVD TiO_2"; with W. G. Lai and K. L. Siefering; *Materials Science Monographs*, **67**, 151-159 (1991).

37. "Atmospheric Pressure CVD of Copper Thin Films: I. Horizontal Hot Wall Reactor", with W. G. Lai and Y. Xie; *J. Electrochem. Soc.*, **138** (11), 3499-3504 (1991).

38. "Copper(I) Precursors for Chemical Vapor Deposition of Copper Metal"; with Kumar, R.; Fronczek, F. R.; Maverick, A. W.; and Lai, W. G.; *Chem. Maters.*, **4** (3), 577-82 (1992).

39. "Reaction Kinetics of CVD Copper"; with Lai, W. G.; Maverick, A. W.; Kumar, R.; and Ajmera, P. K.; pp. 367-373 in Advanced Metallization for ULSI Applications; Rana, V.V.S.; Joshi, R.V.; Ohdomari, I.; eds.; Materials Research Society, Pittsburgh, PA (1992).

40. "Aerosol Synthesis of Aluminum Nitride Powders", with Albert A. Adjaottor; in Synthesis and Processing of Ceramics: Scientific Issues; W. E. Rhine, T. M. Shaw, R. J. Gottschall, Y. Chen, eds.; (Materials Research Society Symposium Proceedings 249; MRS, Pittsburgh, PA (1992), pp. 133-138.

41. "Aerosol Synthesis of Aluminum Nitride Powder using Metalorganic Reactants", with Albert A. Adjaottor; *J. Amer. Ceram. Soc.*, **75** (12) 3209-14 (1992).

42. "Chemical Vapor Deposition of Copper from Cu(II) Precursors"; with A. W. Maverick, The Chemistry of Metal CVD, T. Kodas and M. Hampden-Smith (Eds), VCH Verlagsgesellschaft mbH, Weinheim, 1994.

43. "Kinetics and Transport Effects in Copper CVD Using Alcohol Adducts of $Cu(HFAC)_2$"; with Lai, W. G.; Wang, J; Maverick, A. W.; Isovitch, R.; Fan, H.; in Advanced Metallization for ULSI Applications; Blumenthal, R.; Janssen, G.; Eds.; 123-127; Materials Research Society, Pittsburgh, PA (1995).

44. "Reactor Transport Effects in Copper APCVD"; with Jue Wang; Reginald B. Little; and Gilbert Lai; *Thin Solid Films*, **262** 31-38 (1995).

45. "Gas Phase Kinetics for TiO_2 CVD: Hot Wall Reactor Results"; with Zhang, Q.; *Thin Solid Films*, **263** 65-71 (1995).

46. "Lactic Acid Solutions for Wet Chemical Etching of InP for Microelectronic Devices"; Ikossi-Anastasiou, K.; Binari, S.C.; Kelner, G.; Boos, J.B.; Kyono, C.S.; Mittereder, J.; and Griffin, G.L.; *Proc. Electrochem. Soc.*, **95-6** 270-86 (1995).

47. "Wet Chemical Etching with Lactic Acid Solutions for InP-based Microelectronic Devices"; Ikossi-Anastasiou, K.; Binari, S.C.; Kelner, G.; Boos, J.B.; Kyono, C.S.; Mittereder, J.; and Griffin, G.L.; *J. Electrochem. Soc.*, **142** 3558-64 (1995).

48. "Kinetics and Mechanism of Copper CVD Using $Cu(hfac)_2$ and Related Adducts"; Griffin, G.L.; Borgharkar, N.S.; Maverick, A.W.; Fan, H.; in Advanced Metalization and Interconnect Systems in 1995; Ellwanger, R.; Wang, S.-Q.; eds.; 195-199; Materials Research Society, Pittsburgh, PA (1996a).

49. "Kinetics and Mechanism of Copper CVD using $Cu(hfac)_2$"; Borgharkar, N.S.; Griffin, G.L.; in 13th International Conference on Chemical Vapor Deposition; Besmann, T.M.; Robinson, McD.; Ulrich, R.K.; Allendorf, M.D.; Hitchman, M.L.; Komiyama, H.; eds.; *Proc. Electrochem. Soc.*, **96-5**, 770-775 (1996).

50. "Microstructural and Thermal Analyses of Crystallization in Ultrafine Amorphous Titania Particles"; Yin, J.-S.; He, L.; Griffin, G.L.; Ma, E.; in Chemistry and Physics of Nanostructures and Related Non-Equilibrium Materials; Ma, E.; Fultz, B.; Shull, R.; Morral, J.; Nash, P., eds.; pp23-34; The Minerals, Metals, and Materials Society (1997).

51. "Toward a Unified Reaction Mechanism for Copper CVD"; Borgharkar, N.S.; Griffin, G.L.; *J. Electrochem. Soc.*, **145**, 347-352 (1998).

52. "Alcohol Assisted Growth of Copper CVD Films"; Borgharkar, N.S.; Griffin, G.L.; James, A.; Maverick, A.W.; *Thin Solid Films*, **320**, 86-94 (1998).

53. "Solution Delivery for Copper CVD using $Cu(hfac)_2$ Reduction"; Griffin, G.L.; Borgharkar, N.S.; Fan, H.; Maverick, A.W.; in Advanced Metallization and Interconnect Systems for ULSI Applications in 1997; Cheung R., Klein, J., Tsubouchi, K., Murakami, M., Kobayashi, N., eds.; Materials Research Society, Warrendale PA, 1998; pp469-473.

54. "Solution Delivery of $Cu(hfac)_2$ for Alcohol-Assisted Copper CVD"; Borgharkar, N.S.; Griffin, G.L.; Fan, H.; Maverick, A.W.; *J. Electrochem. Soc.*, **146**, 1041-1045 (1999).

55. "Chemical Vapor Deposition of Copper Thin Films: Comparison of $Cu(FOD)_2$ vs. $Cu(HFAC)_2$"; Griffin, G.L.; Boey, J.Y.-S.; Fan, H.; Maverick, A.W.; in Advanced Metalization Conference in 1998; Sandhu, G.S.; Koerner, H.; Murakami, M.; Yasuda, Y.; Kobayashi, N., eds.; Materials Research Society, Warrendale PA, 1999; pp123-128.

56. "Solution Delivery for Copper CVD using $Cu(hfac)_2$ Reduction"; Zeng, C.; Borgharkar, N.S.; Griffin, G.L.; Fan, H.; Maverick, A.W.; in Advanced Interconnects and Contact Materials and Processes for Future ICs; Murarka, S.P.; Eizenberg, M.; Fraser, D.B.; Madar, R.; Tung, R., eds.; Materials Research Society Proceedings **514**, Warrendale PA, 1999; pp315-319.

57. "Comparison of Copper CVD using $Cu(fod)_2$ and $Cu(hfac)_2$ Reduction"; Boey, J.S.; Griffin, G.L.; Maverick, A.W.; Fan, H.; in Advanced Interconnects and Contacts; Edelstein, D.C.; Kikkawa, T.; Ozturk, M.; Tu, K.-N.; Weitzman, E., eds.; Materials Research Society, Warrendale PA, 1999; pp251-255.

58. "Alcohol and Amine Adducts of $Cu(hfac)_2$ for CVD Copper"; Maverick A.W.; Fan, H.; Bufaroosha, M.S.; Cygan, Z.T.; James, A.M.; Fronczek, F.R.; Griffin, G.L.; Boey, J. Y.; in Advanced Metallization Conference 1999; Gross, M.E.; Gessner, T.; Kobayashi, N.; Yasuda, Y., eds.; Materials Research Society, Warrendale PA, 2000; pp201-205.

59. "Solution-Based Precursor Delivery for Copper CVD"; Wang, L.; Griffin, G.L.; in Silicon Materials Processing -- Characterization and Reliability; Veteran, J.; O'Meara, D.L.; Misra, V.; Ho, P.; Materials Research Society Proceedings **716**, Warrendale, PA 2002; pp513-517.

60. "Kinetics of Copper CVD using Solution Delivery of Cu(hfac)$_2$ and Isopropanol"; Wang, L.; Griffin, G.L.; *J. Electrochem. Soc.* **153**(3) pC137-C141 (2006).

61. "Batch CVD Process for Depositing Pd Activation Layers"; Wang, L.; Griffin, G.L.; *J. Electrochem. Soc.* **154**(3) pD151-155 (2007).

62. "Role of Surface Oxide Layer during CO_2 Reduction at Copper Electrodes"; Tsia, C.-C.; Bugayong, J.; Griffin, G. L.; in Materials for Catalysis in Energy; Jiang, D.; Kung, H. K.; Jin, R.; Rioux, R. M.; Materials Research Society Proceedings **1446**, Warrendale, PA (2012); pp59-64.

63. "Electrochemical Reduction of CO_2 using Supported Cu_2O Catalysts"; Bugayong, J.; Griffin, G. L.; in Electrochemical Interfaces for Energy Storage and Conversion—Fundamental Insights from Experiments to Computations; Materials Research Society Proceedings **1542**, mrss13-1542-g05-11 doi:10.1557/opl.2013.833.

64. "Electrochemical Reduction of CO_2 using Supported Cu_2O Nanoparticles"; Bugayong, J.; Griffin, G. L.; in Electrochemical Synthesis of Fuels 2; X.D. Zhou, M.B. Mogensen, J.A. Stasser, G. Brisard, W.E. Mustain, M.C. Williams, eds; Electrochemical Society Transactions Volume 58, Issue 2 (2013).

65. "Surface phases of $Cu_2O(111)$ under CO_2 Electrochemical Reduction Conditions"; Nie, X.; Griffin, G. L.; Janik, M. J; Asthagiri, A.; Catal. Commun. (2014); http://dx.doi.org/10.1016/j.catcom.2014.02.022

66. "Electrochemical Reduction of CO_2 using Copper Oxide Nanoparticles Supported on Glassy Carbon Electrodes"; Bugayong, J.; Griffin, G. L.; in Fuel Cells, Electrolyzers and Other Electrochemical Energy Systems; Materials Research Society Proceedings **1677**, mrss14-1677-m07-11

67. "Electrochemical Reduction of CO_2 Using Bi-Layer Cu_2O Electrodes"; Joel Bugayong and Gregory L Griffin; ECS Trans. 2015 66(3): 61-65; doi:10.1149/06603.0061ecst

Presentations - Gregory L. Griffin

1. "Temperature Programmed Desorption Applied to Porous Catalysts", presented at symposium "Surface Science and Catalysis: UHV and Process Pressure", 182nd ACS National Meeting, New York, August, 1981.

2. "Co-adsorption Studies of CO and H_2 on ZnO Using IR and TPD Measurements", presented at Seventh North American Meeting of the Catalysis Society, Boston, October, 1981.

3. "Co-adsorption Studies of CO and H_2 on ZnO Using IR and TPD Measurements", presented at 74th AIChE Annual Meeting, New Orleans, November, 1981.

4. "TPD Studies of Adsorbate Interactions on Cu/ZnO Methanol Synthesis Catalysis", presented at symposium "Surface Science of Catalysis: Temperature-Programmed Studies of Porous Catalysts", 184th National ACS Meeting, Kansas City, September 1982.

5. "XPS Studies of Initial Oxide Formation on Zn(0001) Surfaces", ibid.

6. "TPD Studies of Adsorbate Interactions on Cu/ZnO Methanol Synthesis Catalysis", presented at 75th AIChE Annual Meeting, November, 1982.

7. "Inductive Interactions on Catalyst Surfaces", presented at 17th ACS Great Lakes Regional Meeting, Minneapolis, June, 1983.

8. "H_2 Adsorption on Cu/ZnO Methanol Synthesis Catalysts: Influence of Active Site Oxidation State", presented at 186th ACS National Meeting, Washington, D.C., August, 1983.

9. "Temperature Programmed Desorption Techniques Applied to Heterogeneous Catalyst Systems", presented at 12th NATAS Conference Williamsburg, September, 1983.

10. "Influence of Cation Oxidation State Changes in Cu/ZnO Catalysts", presented at MRS Annual Meeting, Boston, November, 1983.

11. "Adsorption Behavior of Mixed Cu/ZnO Surfaces", presented at 187th ACS National Meeting, St. Louis, April, 1984.

12. "Photo-Induced Selectivity Changes in Supported MoO_3/TiO_2 Catalysts", ibid.

13. "Vibrational Spectroscopy of Adsorbed CO at Electrode Surfaces", presented at "Symposium on Photochemical and Electrochemic Surface Science: Techniques for Characterization of Electrode Surfaces", 188th National ACS Meeting, Philadelphia, August 1984.

14. "Nature of H_2 Desorption Sites in Cu/ZnO Synthesis Catalysts", presented at 188th National ACS Meeting, Philadelphia, August 1984.

15. "Active Sites for Methanol Decomposition on ZnO Surfaces", presented at symposium on "Activation of Carbon Oxides by Oxides and Oxidized Metal Catalysts", presented at 189th National ACS Meeting, Miami Beach, April, 1985.

16. "Catalytic Chemistry of Copper: Crystals, Clusters, and Cations", presented at symposium on "Catalysis of the Group IB Metals", ibid.

17. "Chemical Reactions of Methanol on ZnO and Cu/ZnO Surfaces", presented at Second China-U.S.-Japan Symposium on Heterogeneous Catalysis, Berkeley, July, 1985.

18. "Application of Polarization Modulated Infrared Spectroscopy to Studies of Kinetic Processes on Electrodes", presented at symposium on "Vibrational Spectroscopy of Electrode Surfaces", 190th National ACS Meeting, September, 1985.

19. "Photo-Oxidation Studies Using MoO_3/TiO_2 Monolayer Catalysts", presented at 1985 Annual Meeting of AIChE, November, 1985.

20. "In-situ Vibrational Spectroscopy of Linear and Bridging Carbon Monoxide Adsorbed on Platinum Electrodes", presented at 192nd National ACS Meeting, Anaheim, September, 1986.

21. "Photo-Oxidation of Methanol Using V_2O_5/TiO_2 and MoO_3/TiO_2 Surface Oxide Monolayer Catalysis", ibid.

22. "Photo-Assisted vs. Thermal Selective Oxidation of 1-Butanol over TiO_2", presented at 194th National ACS Meeting, New Orleans, LA, September, 1987.

23. "Vibrational Behavior of Carbon Monoxide Adsorbed on Platinum in Non-Acidic Electrolytes", ibid.

24. "Direct Synthesis of Higher Alcohols Using Copper and Copper/ Cobalt Based Catalysts", ibid.

25. "Direct Synthesis of Higher Alcohols Using Alkali Copper/Cobalt Alloy Catalysts", presented at 1987 Annual AIChE Meeting, New York, November, 1987.

26. "Photo-Assisted vs. Thermal Selective Oxidation of 1-Butanol over TiO_2", ibid.

27. "Direct Synthesis of Higher Alcohols Using Copper/Cobalt Catalysts"; poster presentation at 1988 Gordon Research Conference on Catalysis; Newport, RI; August, 1988.

28. "Direct Synthesis of Higher Alcohols via CO Hydrogenation Using Copper/Cobalt Catalysts"; presented at 196th National American Chemical Society Meeting; Los Angeles, CA; Septmeber, 1988.

29. "Kinetics of CVD Growth of TiO_2 via Decomposition of Tetraisopropyl Orthotitanate"; presented at 1988 Annual AIChE Meeting; Washington, DC; November, 1988.

30. "Kinetic Studies and Surface Characterization of Copper-Cobalt Catalysts for Higher Alcohol Synthesis"; presented at 1988 Annual AIChE Meeting; Washington, DC; November, 1988.

31. "Kinetics of CVD Growth of TiO_2 via Decomposition of Tetraisopropyl Orthotitanate"; presented at 91st Annual Meeting of the American Ceramic Society; Indianapolis, IN; April, 1989.

32. "Kinetic Studies and Surface Characterization of Copper and Copper-Cobalt Catalysts for Direct Alcohol Synthesis"; presented at 11th North American Meeting of the Catalysis Society; Dearborn, MI, May 1989.

33. "Kinetics of CVD Growth of TiO_2 via Decomposition of Tetraisopropyl Orthotitanate", presented at 63rd American Chemical Society Colloid and Surface Science Symposium, Seattle, Washington, June 1989.

34. "Copper-Cobalt Catalysts for Direct Alcohol Synthesis"; invited seminar at University of Akron, October 19, 1989.

35. "Chemical Vapor Infiltration for Catalyst Preparation"; presented at 1989 Annual AIChE Meeting, San Francisco, November, 1989; paper 51i.

36. "Growth Kinetics of CVD TiO_2: Influence of Carrier Gas"; presented at 1989 Annual AIChE Meeting, San Francisco, November, 1989.

37. "Aerosol Reactor Design for Aluminum Nitride Powder Synthesis"; presented at Third International Conference on Ceramic Powder Processing Science, San Diego, February, 1990.

38. "Aerosol Reactor Design for Aluminum Nitride Powder Synthesis"; presented at the 1990 Annual Meeting of the American Association for Aerosol Research, Philadelphia, June, 1990.

39. "Deposition Kinetics of CVD TiO_2"; presented at the 7th CIMTEC World Ceramics Conference, Montecatini Terme, Italy, June, 1990.

40. "Atmospheric Pressure CVD of Copper Thin Films"; Paper 117a, presented at the AIChE 1990 Annual Meeting, Chicago, November, 1990.

41. "Aerosol Reactor Design for Aluminum Nitride Powder Synthesis"; Paper 213b, presented at the AIChE 1990 Annual Meeting, Chicago, November, 1990.

42. "Integral Analysis of Chemical Vapor Deposition Reactors"; G. L. Griffin, invited seminar at University of Florida; February 14, 1991.

43. "Integral Analysis of Chemical Vapor Deposition Reactors"; G. L. Griffin, invited seminar at Tulane University; March 8, 1991.

44. "Chemical Vapor Deposition of TiO_2 Thin Films"; Paper 121-E, presented at the 93rd Annual Meeting of the American Ceramic Society; Cincinnati, May, 1991.

45. "Aerosol Reactor Synthesis of Aluminum Nitride Powder"; Paper 2E.4, presented at the 1991 Annual Meeting of the American Association of Aerosol Research; Traverse City, MI, October, 1991.

46. "Chemical Vapor Deposition of TiO_2 Thin Films"; Paper 19g, presented at the 1991 AIChE Annual Meeting; Los Angeles, November, 1991.

47. "Aerosol Synthesis of Aluminum Nitride Powders"; Paper Q9.2, presented at the 1991 Fall Materials Research Society Meeting; Boston, December, 1991.

48. "Aerosol Synthesis of Aluminum Nitride Powders"; Paper P4.5, presented at the 1992 Spring Materials Research Society Meeting; San Francisco, April, 1992.

49. "Aerosol Synthesis of Aluminum Nitride Powder Using Metalorganic Reactants"; Paper 195a, presented at the 1992 AIChE Annual Meeting; Miami Beach, November, 1991.

50. "Growth Kinetics and Morphology of CVD Copper"; Paper 201c, presented at the 1992 AIChE Annual Meeting; Miami Beach, November, 1992.

51. "Kinetics and Reaction Mechanism of TiO_2 Chemical Vapor Deposition using Titanium tetra-Isopropoxide Decomposition"; Paper 178, presented at the 184th Electrochemical Society Meeting; New Orleans, October, 1993.

52. "Surface Reactions in Copper CVD Using $Cu(hfac)_2$"; Paper 90a, presented at the 1993 AIChE Annual Meeting; St. Louis, November, 1993.

53. "Homogeneous Reactions in TiO_2 LPCVD using Alkoxide Reactants"; Paper 91b, presented at the 1993 AIChE Annual Meeting; St. Louis, November, 1993.

54. "Aerosol Synthesis of AlN Powder using Alkylamide Precursors"; Paper 75a, presented at the 1993 AIChE Annual Meeting; St. Louis, November, 1993.

55. "Kinetics and Transport Effects in Copper CVD using Alcohol Adducts of $Cu(hfac)_2$; Presented at conference on Advanced Metalization for ULSI Applications in 1994; Austin, Texas, October, 1994.

56. "Surface Reactions in Copper CVD Using $Cu(hfac)_2$; Paper E2.6, presented at the 1994 Fall Materials Research Society Meeting; Boston, November, 1994.

57. "Kinetics and Mechanism of Copper CVD using $Cu(hfac)_2$ and Related Adducts"; presented at the conference on Advanced Metalization for ULSI Applications in 1995; Portland, Oregon, October, 1995.

58. "Growth Rates and Nucleation Effects for Copper CVD using $Cu(hfac)_2$"; presented at the 32 Annual Technical Meeting of the Society of Engineering Science (Session 3d, paper 187); New Orleans, October, 1995.

59. "Microbalance Studies of Copper CVD Kinetics"; Paper 159b, presented at the 1995 AIChE Annual Meeting; Miami Beach, November, 1995.

60. "Kinetics and Mechanism of Copper CVD Using $Cu(hfac)_2$"; paper 864, presented at the 13th International Conference on Chemical Vapor Deposition; Los Angeles, May, 1996.

61. "Rate Enhancement Strategies for Copper CVD"; paper 200f, presented at the 1996 AIChE Annual Meeting; Chicago, November, 1996.

62. "Rate Enhancement Strategies for Copper CVD"; paper K5.2, presented at the Spring 1997 Materials Research Society Meeting; San Francisco, April, 1997.

63. "Solution Delivery for Copper CVD using $Cu(hfac)_2$ Reduction"; presented at the conference on Advanced Metalization and Interconnect Systems for ULSI Applications in 1997; San Diego, October, 1997.

64. "Toward a Unified Reaction Mechanism for Copper CVD"; paper 163a, presented at the 1997 AIChE Annual Meeting; Los Angeles, November, 1997.

65. "Solution Delivery for Copper CVD using $Cu(hfac)_2$ Reduction"; paper I7.11, presented at the Spring 1998 Materials Research Society Meeting; San Francisco, April, 1998.

66. "Comparison of Copper CVD using $Cu(fod)_2$ and $Cu(hfac)_2$ Reduction"; paper P.17, presented at the Advanced Metalization Conference 1998; Colorado Springs, October, 1998.

67. "Solution Delivery for Copper CVD Using $Cu(hfac)_2$ Reduction"; paper 210e, presented at the 1998 AIChE Annual Meeting; Miami, November, 1998.

68. "Comparison of Copper CVD using $Cu(fod)_2$ and $Cu(hfac)_2$ Reduction"; paper N5.24, presented at the Spring 1999 Materials Research Society Meeting; San Francisco, April, 1999.

69. "Effect of H2O vs. i-PrOH as co-reactants for Copper Chemical Vapor Deposition"; paper #179 COLL, presented at the American Chemical Society 218th National Meeting; New Orleans, August, 1999.

70. "Alcohol and Amine Adducts of Cu(hfac)2 for CVD Copper"; paper P.6, presented at the Advanced Metalization Conference 1999; Orlando, FL, October, 1999. (Presented by A.W. Maverick).

71. "Effect of H_2O vs. *i*-PrOH as Co-reactants for Copper Chemical Vapor Deposition"; paper 188i, presented at the 1999 AIChE Annual Meeting; Dallas, November, 1999.

72. "Solution Based Precursor Delivery for Copper CVD"; paper 214j, presented at the 2000 AIChE Annual Meeting; Los Angeles, November, 2000.

73. "Solution-Based Precursor Delivery for Copper CVD"; paper B11.12, presented at the Spring 2002 Materials Research Society Meeting; San Francisco, April, 2002.

74. "Solution-Based Precursor Delivery for Copper CVD"; paper 210f, presented at the 2002 AIChE Annual Meeting; Indianapolis; November, 2002.

75. "Solution Delivery CVD for Palladium Seed Layer Deposition"; paper 177b, presented at the 2003 AIChE Annual Meeting; San Francisco, November, 2003.

76. “Reaction Mechanism for Alcohol-Assisted Chemical Vapor Deposition of Copper using Solution Based Precursor Delivery ”; paper A.9, presented at the 205th Meeting of the Electrochemical Society; San Antonio, TX, May, 2004. (Presented by L. Wang).

77. "Chemical Vapor Deposition of Palladium Seed Layers"; paper 373d, presented at the 2004 AIChE Annual Meeting; Austin TX, November, 2004.

78. "Chemical Vapor Deposition of Palladium Seed Layers"; paper 206f, presented at the 2005 AIChE Annual Meeting; Cincinnati OH, November, 2005.

79. "Regenerative Methanol Fuel Cells: Reduction of CO_2 to CH_3OH on Oxidized Cu Electrodes"; Electrochemical Society: Fall Meeting, 2010; October 10-15, 2010; Las Vegas, Nevada (presented by M. Ren; co-authored by M. Le and J. Flake).

80. "Electrochemical Reduction of CO_2 to Methanol at Copper Based Surfaces"; presented at the Electrochemical Society Fall Meeting, October 9-14, 2011; Boston, MA (paper 1500, session B12; presented by J. Flake; co-authored by M. Ren, M. Le, Z. Zhang, P. Sprunger, and R. Kurtz).

81. “Role of Surface Oxide Layer during CO_2 Reduction at Copper Electrodes”; presented at the Spring 2012 Materials Research Society Meeting; San Francisco, April, 2012 (paper U6.2; co-authored by C.-C. Tsai and J. Bugayong).

82. "Kinetics of Ethanol formation from CO_2 using Supported Copper (I) Oxide Catalyst"; presented at the 68th Southwest Regional Meeting of the American Chemical Society; Baton Rouge, LA, September, 2012 (poster 297; presented by J. Bugayong).

83. “Electrochemical Reduction of CO2 Using Supported Cu2O Catalysts ”; presented at the Spring 2013 Materials Research Society Meeting; San Francisco, April, 2013 (poster G5.11; presented by J. Bugayong).

84. "Electrochemical Reduction of CO_2 using Supported Cu_2O Nanoparticles"; presented at the Fall 2013 Electrochemical Society Meeting, October 27 - November 1, 2013; San Francisco, CA (paper 696, session B6; co-authored by J. Bugayong).

85. “Electrochemical Reduction of CO_2 using Copper Oxide Nanoparticles supported on Glassy Carbon Electrodes”; presented at the Spring 2014 Materials Research Society Meeting; San Francisco, April, 2014 (paper M9.11; co-authored with J. Bugayong).

86. “Electrochemical Reduction of CO_2 on Supported Cu_2O Electrocatalysts”; 2014 ACS Fall Meeting, August 10-14, 2014, San Francisco, CA (presented by J. Bugayong)

87. “Electrochemical Reduction of CO_2 using Copper Oxide Derived Catalysts”; presented at the 2014 AIChE Annual Meeting; Atlanta GA, November, 2014 (paper 268d; co-authored with J. Bugayong).

88. “Electrochemical Reduction of CO_2 Using Bi-Layer Cu_2O Electrodes”; presented at the 227th Electrochemical Society Meeting, May 24-28, 2015, Chicago, IL (paper 1521, session I02; co-authored with J. Bugayong).

Grants and Contracts (completed) - Gregory L. Griffin

1.	NSF/CPE Research Initiation "Co-adsorption of CO and H_2 on Cu/ZnO Mixtures using Combined Infrared and Temperature Programmed Desorption" (NSF/CPE-8105823)	$48,000	5/ 1/81 - 10/31/83
2.	NSF - Chemical & Process Engineering "High Pressure Kinetic Measurements of Methanol Synthesis on Well-Characterized Cu/ZnO Surfaces" (NSF/CPE-8110754)	$79,459	12/ 1/81 - 11/30/84
3.	NSF - Engineering Research Equipment "Acquisition of an FTIR Spectrometer for in-situ Reaction Studies" (NSF/CPE-8305272) (Lead PI, with 1 co-PI)	$48,000	6/ 1/83 - 11/30/84
4.	ACS - Petroleum Research Fund "Photo-Assisted Control Partial Oxidation Reactions on Heterogeneous Catalysts" (PRF#14072-AC5)	$45,000	9/ 1/82 - 8/31/85
5.	DOE - Basic Energy Sciences "Direct Alcohol Synthesis Reactions on Cobalt Modified Methanol Catalysts" (DOE-FG02-ER13392)	$146,686	7/15/85 - 7/14/87
6.	DOE - Corrosion Research Center (U Minn) "Stability of Foreign Oxide Films on Metal Surfaces" (DOE-DE-AC02-79 ER10450)	$187,572	9/ 1/81 - 8/31/87
7.	DOE - Corrosion Research Center (U Minn) "Corrosion of Semiconducting Photoelectrodes" (DOE-DE-AC02-79 ER10450) (Joint with 1 co-PI)	$183,305	9/ 1/82 - 8/31/87
8.	DOE - Corrosion Research Center (U Minn) "Vibrational Studies of Adsorbates on Clean and Passivated Electrodes" (DOE-DE-AC02-79 ER10450) (Joint with 1 co-PI)	$262,501	9/ 1/83 - 8/31/87
9.	ACS - Petroleum Research Fund "Photo-Assisted Partial Oxidation of Hydrocarbons on Silane-Modified TiO2" (PRF #17059-AC5-C)	$35,000	9/ 1/85 - 8/31/87

Grants and Contracts (completed) - Gregory L. Griffin - cont. 2

10.	LSU - Hazardous Waste Research Center "Advanced Ceramic Applications for Hazardous Waste Processing"	$ 16,850	2/12/88 - 2/11/89
11.	LSU - Center for Energy Studies "FTIR Spectrometer Upgrade"	$ 12,500	9/1/88 - 6/30/89
12.	DOE - Basic Energy Sciences "Direct Alcohol Synthesis Using Modified Cobalt Catalysts" (DOE-FG05-87ER13814)	$139,542	9/29/87 - 9/14/89
13.	Shell Companies Foundation "Shell Faculty Career Initiation Fund"	$ 55,000	7/1/87 - 6/30/91
14.	LSU/IBM/Martin Marietta "Chemical Vapor Deposition of Electronic Materials" (Lead PI, with 2 co-PIs)	$274,246	1/ 1/89 - 12/31/91
15.	LEQSF - Enhancement Program "Establishment of an Environmental Scanning Electron Microscope Facility" (Lead PI, with 6 co-PIs) (LEQSF(1991-92)-ENH-21)	$220,000	7/ 1/91 - 6/30/92
16.	LEQSF - Industrial Development "Reactor Design for Aluminum Nitride Powder Synthesis using Chemical Precursors" (LEQSF (1989-92)-RD-B-6)	$177,713	7/ 1/89 - 9/30/92
17.	LEQSF - Research Competitiveness "Processing of Porous Ceramic Materials by Cyclic Chemical Vapor Infiltration" (LEQSF (1989-92)-RD-A-4)	$133,000	7/ 1/89 - 6/30/93
18.	LEQSF - Enhancement Program "Establishment of an ESEM X-ray Microanalysis Facility" (Lead PI, with 2 co-PIs) (LEQSF(92-93) ENH-TR-14)	$ 97,300	7/ 1/92 - 6/30/93
19.	ACS - Petroleum Research Fund "Aerosol Synthesis of Aluminum Nitride Pre-ceramic Powders via Chemical Precursors"	$ 40,000	1/01/92 - 8/31/94

20.	NSF - CTS (CTS-9412217) "Engineering Research Equipment: Mass Spectrometer for Chemical Vapor Deposition Studies"	$ 46,000	7/01/94 - 6/30/95
21.	NSF - CTS - CRP (CTS-9311527) "Kinetics and Reactor Design of Copper CVD Processes" (Lead PI, with 1 co-PI)	$243,367	9/15/93 - 2/28/97
22.	Board of Regents "Modernization of Environmental Scanning Electron Microscope User Facility"	$ 25,000	6/01/98 - 6/30/99
23.	Board of Regents "LSU Materials Characterization Facility Enhancement: Acquisition of a Transmission Electron Microscope" (co-PI with 3 others)	$150,000	9/01/98 - 06/30/99
24.	NSF - MRIP "Acquisition of an Analytical Transmission Electron Microscope" (co-PI with 3 others)	$310,000	9/01/98 - 06/30/99
25.	NSF - CTS - CRP (CTS-9612157) "Rate Enhancement and Microstructure Control of Copper CVD Processes" (Lead PI, with 1 co-PI)	$297,254	1/01/97 - 12/31/00
26.	NSF - CTS - CRP (CTS-0222028) "SGER - Novel Reaction Chemistry for CVD of Tantalum Barrier Layers" (Lead PI, with 1 co-PI)	$39,937	5/01/02 - 4/30/03
27.	DOE - EFRC "Energy Frontiers Research Center - Computational Catalysis and Atomic-Level Synthesis of Materials: Building Effective Catalysts from First Principles" (co-PI with 21 others; amount shown is GLG share of $11.6M total award)	$ 361,487	06/18/09 - 07/31/15

Graduate Students Supervised - Gregory L. Griffin

Master's Degrees (Completed)

1. Yien Chi Liu, "Morphology and Activity of MoO_3/TiO_2 Photocatalysts"; April, 1984.
2. Rene Rodriguez, "Oxidation of CO on Pt Electrodes: Adsorption and Inhibition with Nitriles"; December, 1984.
3. Evelyn Ann Taylor, "Alcohol Reactions on Clean and Organosilane Modified Titanium Dioxide"; September, 1986.
4. Casey John Nolden, "Hydrogen Adsorption on ZnO Thin Films"; July, 1987.
5. Ganapathy Ayappa, "FTIR Spectroscopy of Formaldehyde Reactions on Cu/ZnO Catalysts"; August, 1987.
6. Rajsekhar Kalapatapu, "Alcohol Synthesis using Mixed Copper-Cobalt Catalysts"; August, 1990.
7. Gilbert Wing Cheong Lai, "Chemical Vapor Deposition of Copper Thin Films"; August, 1991.
8. Albert Amatey Adjaottor, "Aerosol Synthesis of Aluminum Nitride Ceramic Powder"; December, 1991.
9. Bhalchandra Kanade, "Reactor Modeling of Aluminum Nitride Aerosol Synthesis"; October, 1992.
10. Carlos Alberto Rosas, "Aerosol and Polymeric Ceramic Precursor Synthesis of Aluminum Nitride"; October, 1992.
11. Reginald Bernard Little, "Chemical Vapor Deposition of Copper Thin Films"; December, 1992.
12. Johnny Yi-Sang Boey, "Chemical Vapor Deposition of Copper", December, 1998.
13. Raman Thiruvenkatachari, "Chemical Vapor Deposition of Copper Thin Films", August 2000.
14. Gibert Magpantay, “Photocatalytic Oxidation of Ethanol using Macroporous Titania”, September 2008

Graduate Students Supervised - Gregory L. Griffin (cont. 2)

Doctoral Degrees (Completed)

1. Lap Hung Sunny Chan, "Comparative Adsorption/Desorption Studies on Zn, ZnO, and Cu/ZnO Surfaces"; June, 1985.

2. Wade Jeffrey Tornquist, "Infrared Spectra of Carbon Monoxide on Platinum"; August, 1986.

3. David Lloyd Roberts, "Identification and Characterization of Active Sites and Stable Surface Intermediates on Copper-Based Methanol Synthesis Catalysts by Temperature Programmed Desorption and FTIR"; May, 1987.

4. Natalie Ruth Gruia Blake, "Photo-Assisted Selective Oxidation of Hydrocarbons on Semiconducting Oxides"; June, 1987.

5. Kevin Lyle Siefering, "Growth Kinetics of Thin Film Oxides by Chemical Vapor Deposition"; October, 1988.

6. Qingming Zhang, "Chemical Vapor Deposition of TiO_2 Thin Films"; August, 1993.

7. Gilbert Wing Cheong Lai, "Reactor Analysis of Chemical Vapor Deposition of TiO_2 and Cu Thin Films"; July, 1994.

8. Narendra Borgharkar, "Chemical Vapor Deposition of Copper Films"; December, 1997.

9. Lidong Wang, "Chemical Vapor Deposition of Thin Films for ULSI Interconnect Metallization"; May, 2005.

10. Joel Bugayong, "Electrochemical Reduction of CO_2 using Supported Copper Oxide Electrodes"; antic. December 2014.

Visiting Scholars / Postdoctoral Fellows

1. Mr. Weixiong Pan, Lecturer, Tshinghua University, Beijing, P. R. China; (9/85 - 8/88).

2. Mr. Rong Cao, Engineer, Research Institute of Nanjing Chemical Industry Company, Nanjing, P. R. China (9/86 - 8/87).

3. Dr. Yuming Xie, Nanjing University, Nanjing, P. R. China (9/88 - 8/89)

4. Dr. Jue Wang, Dalian Institute of Chemical Physics, , P.R. China (11/90 - 8/92)