Curriculum Vitae

Shouzhong Zou

Contact

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Research Interests

1. Electrocatalysis: synthesis and characterization of size, shape and composition controlled metal nanocrystals; carbon-based catalysts for ORR and HER; single atom electrocatalysts; polymer electrolyte membrane fuel cells; electroreduction of CO_2; gas sensing
2. Surface vibration spectroscopy: surface-enhanced Raman and infrared spectroscopies; SiO_2-Au core-shell nanoparticles, supported lipid membranes

Education

1999 Ph.D. in Chemistry, Purdue University (with Dr. Michael J. Weaver)
1994 M.S. in Chemistry, Xiamen University (with Dr. Zhong-Qun Tian)
1991 B.S. in Chemistry, Xiamen University, China

Professional Appointments

07/2021 – present	Professor, Department of Chemistry, American University
07/2015 – 06/2021	Professor & Chair, Department of Chemistry, American University
01/2015 – 06/2015	Research Chemist, Joint Pathology Center (on leave from Miami University)
08/2008 – 06/2015	Associate Professor, Department of Chemistry and Biochemistry, Miami University (on leave 01/2015-06/2015)
08/2002 – 07/2008	Assistant Professor, Department of Chemistry and Biochemistry, Miami University
10/1999 – 07/2002	Postdoctoral Scholar, Division of Chemistry and Chemical Engineering, California Institute of Technology (with Drs. Fred C. Anson & Ahmed H. Zewail)

Honors and Awards

Senior Visiting Scholar, Fudan University, Shanghai, China (2012-2014)
Lilly Graduate Fellowship (1998-99)

Reilley Upjohn Award in Analytical Chemistry (1998)
Energy Research Summer Fellowship of the Electrochemical Society (1998)
Guanghua Award, Xiamen University, China (1992)
Bailin Award, Xiamen University, China (1991)

Professional Societies

American Chemical Society
Electrochemical Society
Society for Electroanalytical Chemistry
International Society of Electrochemistry

External Research Grants

12. NSF, "MRI: Acquisition of an analytical transmission electron microscope (TEM) to enhance research and teaching at American University", support scale: $438,550, supported period: 9/1/2016 – 8/31/2019.PI

11. NSF, supplement to "Electrocatalysis on Structure Controlled Metal Nanocrystals: Unraveling Particle Structure-Catalytic Activity Relationships", support scale: $19,970, supported period: 9/1/2013 – 8/31/2014. (no cost extension to 7/31/2016). PI

10. NSF, "Electrocatalysis on Structure Controlled Metal Nanocrystals: Unraveling Particle Structure-Catalytic Activity Relationships", support scale: $400,001, supported period: 8/15/2012 – 7/31/2015 (no cost extension to 7/31/2016). PI.

9. General Motors, "Electrochemical studies of monodisperse facet-controlled Pt_3Ni nanocrystals as ORR catalysts", support scale: $ 119,192. 11/2010 – 08/2012. PI.

8. Chinese Academy of Sciences, WangKuanCheng fellowship, "Synthesis and characterization of low dimension electrocatalysts for methanol oxidation", $3000, 2009. PI.

7. General Motors, "In-situ vibration spectroscopic and microscopic studies of ionomer-electrode interaction", support scale: $ 106,687. 3/2008 – 12/2009. PI.

6. NSF, "MRI: Acquisition of a High Resolution Analytical Transmission Electron Microscope for the Miami University Electron Microscope Facility", support scale: $616,055. 8/2007 – 3/2011. Co-PI. PI: Dr. Hailiang Dong (Geology), Co-PI: Dr. Richard Edelmann (Electron Microscopic Facility), Dr. John Rakovan (Geology), Dr. Gilbert Pacey.

5. Ohio third frontier, Ohio Department of Development, "Establishment of the Institute for the Development and Commercialization of Advanced Sensor Technology (IDCAST)". Project led by University of Dayton. Total support: $28,000,000. $1,000,000

to Miami University. 08/2007 – 02/2011. Co-PI. PI: Dr. Gilbert Pacey, Co-PI: Dr. James Cox.

4. NSF, "Uniform Metal Nanoparticle Arrays as Model Electrocatalysts: Unraveling the Particle Structure-Reactivity Relationships". $323,000 in total. 08/2006 – 07/2009 (extended to 07/2010). PI.

3. NSF – NER, "Single-Molecule Wires and Electronic Devices Based on Dimetal Complexes Containing Metal-Metal Bonds". $99,997 in total. 09/2004 – 08/2005, extended to 08/2006. PI, with Dr. Hong-Cai Zhou and Dr. Jan Yarrison Rice (Physics Department) as Co-PI.

2. Research Corporation – RIA, "Probing Surface Bonding, Structure and Reactivity on Nanometer Scale by Tip-Enhanced Raman Spectroscopy". $35,000 in total, 04/2004 - 03/2009, PI.

1. ACS – PRF type G, "Probing Surface Bonding, Structure and Reactivity on Nanometer Scale by Tip-Enhanced Raman Spectroscopy". $35,000 in total, 05/2003 – 04/2005, PI.

Selected Internal Grants

1. "Preparing cobalt and nitrogen-doped porous carbons from metal-organic frameworks by flash Joule heating for fuel cell catalysts", DCSGC AU STEM Faculty Summer 2022 Research Program. Support scale: $12,330, 06/01/2022 – 08/31/2022
2. "Developing Single Atom Platinum Catalysts for Valorization of Glycerol", CAS Mellon Research Fund, $4000, Spring 2021.

Selected Internal Grants from Miami University

1. "Biological/Synthetic Scaffolds for the Treatment of Bone Defects", Miami University 2013 Interdisciplinary Research Round Table. Co-PI. PI: Amy Yousefi; other Co-PIs: Paul James, Jing Zhang, Jens Muller. Support scale: $25,000. Support period: June 2013 – December 2014.

2. "Studying fuel cell reactions on a single particle by dark-field microscopy", Research Incentive Award 2013. PI. With Andre Sommer as a Co-PI. Support scale: $40,000. Support period: June 2013 – August 2014.

3. "Improving activity and durability of fuel cell catalysts through nanotechnology", Research Incentive Award 2011. PI. Support scale: $40,000. Support period: June 2011 – August 2012.

4. "Spectroscopic and microscopic studies of ionomer-electrode interaction", Shoupp Award, Phase 1. PI. Support scale: $5000. Support period: June – December 2008.

5. "Center for Advanced Research on Energy (CARE)", Miami University, Co-PI. PI: Shachi Lalvani, other co-PIs: Lei Kerr, Hong Wang and James Cox. Support scare: $50,000. Support period: April 2008 – May 2009.

Publications

90. W. Li and S. Zou, "Co nanoparticles imbedded in Co, N, P-doped porous carbon as an efficient bifunctional catalyst for oxygen reduction and evolution reactions", to be submitted to *Journal of Physical Chemistry C*.

89. H. Li, K. Jiang, S. Zou, W-B. Cai, "Fundamental aspects in CO_2 electroreduction reaction and solutions from in situ vibrational spectroscopies", *Chinese Journal of Catalysis* **2022**, 43, 2772-2791.

88. Liu, Favian; Ghasem Ardabili, Negar; Brown, Izaiah; Rafi, Harmain; Cook, Clarice; Nikopoulou, Rodanthi; Lopez, Arianna; Zou, Shouzhong; Hartings, Matthew ; Zestos, Alexander "Modified Sawhorse Waveform for the Voltammetric Detection of Oxytocin", *J. Electrochem. Soc.* **2022,** 169, 017512.

87. Wei-yi Zhang, Xian-yin Ma, Shouzhong Zou, Wen-bin Cai, "Recent Advances in Glycerol Electrooxidation on Pt and Pd: from Reaction Mechanisms to Catalytic Materials", *Journal of Electrochemistry*, **2021**, 27(3), 233-256.

86. Liu, X., Culhane, C., Li, W., and S. Zou, "Spinach-derived Heteroatom-doped Porous Carbon Sheets for High Performance Oxygen Reduction Catalysts", *ACS Omega*, **2020**, 5(38) 24367-24378.

85. Mohanaraj, S., Wonnenberg, P., Cohen, B., Zhao, H., Hartings, M. R., Zou, S., Fox, D. M., Zestos, A. G., "Gold Nanoparticle Modified Carbon Fiber Microelectrodes for Enhanced Neurochemical Detection", *J. Vis. Exp.* (147), e59552. doi:10.3791/59552 (**2019**).

84. Yongan Tang and Shouzhong Zou, "Formic acid oxidation on Pd thin film coated Au nanocrystals", *Surface*, **2019**, 2(2), 372-386.

83. Wenyue Li and Shouzhong Zou, "PtNi nanoparticles encapsulated in few carbon layers as high-performance catalysts for oxygen reduction reaction", *ACS Appl. Energy Mater.*, **2019**, 2(4), 2769–2778.

82. Guo-Kun Liu, Shouzhong Zou, Daniel Josell, Lee J. Richter, and Thomas P. Moffat, "SEIRAS Study of Chloride Mediated Polyether Adsorption on Cu", *J. Phys. Chem. C*, **2018**, 122, 21933-21951.

81. Xiaojun Liu, Wenyue Li and Shouzhong Zou, "Cobalt and nitrogen-codoped ordered mesoporous carbon as highly efficient bifunctional catalysts for oxygen reduction and hydrogen evolution reactions", *J. Mater. Chem. A*, **2018**, 6, 17067-17074.

80. Wenyue Li, Zhengyu Zhang, Wenjun Zhang, and Shouzhong Zou, "MoS_2 Nanosheets Supported on Hollow Carbon Spheres as Efficient Catalysts for Electrochemical Hydrogen Evolution Reaction", *ACS Omega*, **2017**, 2(8), 5087-5094.

79. Yongan Tang, Lin Dai, and Shouzhong Zou, "Comparison of Oxygen Reduction Reaction Activity of Pt-Alloy Nanocubes", *J. Electrochemistry*, **2017**, 23(2), 199-206.

78. Chenyu Wang, Lihua Zhang, Hongzhou Yang, Jinfong Pan, Jingyue Liu, Charles Dotse, Yiliang Luan, Rui Gao, Cuikun Lin, Jun Zhang, James P. Kilcrease, Xiaodong Wen, Shouzhong Zou, and Jiye Fang, "High Indexed Pt_3Ni Tetrahexahedral Nanoframes Evolved through Preferential CO Etching", *Nano Lett.*, **2017**, 17, 2204-2210.

77. Xiaojun Liu, Shouzhong Zou, and Shaowei Chen, "Ordered mesoporous carbons co-doped with nitrogen and iron as effective catalysts for oxygen reduction reaction", *Nanoscale*, **2016**, 8, 19249-19255.

76. Shouzhong Zou, Xiaojun Liu, and Wenyue Li, "Electrocatalysis of facet controlled noble metal nanomaterials for low temperature fuel cells" in "Electrocatalysts for Low Temperature Fuel Cells: Fundamentals and Recent Advancements", T. Maiyalagan and V. S. Saji (Eds.), Wiley-VCH, Weinheim, Chapter 12, **2017**.

75. Yongan Tang, Xiaowei Chi, Shouzhong Zou and Xiangqun Zeng, "Facet Effects of Palladium Nanocrystals for Oxygen Reduction in an Ionic Liquid and Sensing Applications", *Nanoscale*, **2016**, 8, 5771-9.

74. Ye Wang, Shouzhong Zou and Wen-Bin Cai, "Recent Advances on Electro-oxidation of Ethanol: from Reaction Mechanisms to Catalytic Materials", *Catalysts* (special issue on Electrocatalysis in Fuel Cells), **2015**, 5, 1507-1534.

73. Kun Jiang, Han-Xuan Zhang, Shouzhong Zou and Wen-Bin Cai, "Electrocatalysis of formic acid on palladium and platinum surfaces: from fundamental mechanisms to fuel cell applications", *PhysChemChemPhys*, **2014**, 16, 20360-20376.

72. Kun Jiang, Ke Xu, Shouzhong Zou and Wen-Bin Cai, "B-doped Pd Catalyst: Boosting Room-Temperature Hydrogen Production from Formic Acid-Formate Solutions", *J. Am. Chem. Soc.*, **2014**, 136, 4861-4864.

71. Yongan Tang, Richard E. Edelmann and Shouzhong Zou, "Length tunable penta-twinned palladium nanorods: seedless synthesis and electrooxidation of formic acid", *Nanoscale*, **2014**, 6, 5630-5633.

70. Hongzhou Yang, Yongan Tang, and Shouzhong Zou, "Electrochemical removal of surfactants from Pt nanocubes", *Electrochem. Commun*, **2014**, 38, 134-137.

69. H. Yang, S. Kumar, and S. Zou, "Oxygen reduction on Pt nanoparticle arrays – effects of particle size and interparticle distance", *J. Electroanal. Chem.*, **2013***,* 688, 180-188.

68. Mathew Mattox, Mathew W. Henney, Adam Johnson, and S. Zou, "Adsorption and Electrooxidation of Carbon Monoxide on Sulfur-modified Pt electrodes", *J. Electrochem.,* **2012**, 18, 521-536.

67. Rohit Deshpande, Bo Wang, Lin Dai, Lin Jiang, C. Scott Hartley, Shouzhong Zou, Hong Wang and Lei Kerr, "*Opp*-Dibenzoporphyrins as Light Harvester for Dye-Sensitized Solar Cells", *Chem. Asian J.,* **2012**, 7, 2262-2269.

66. Jun Zhang, Hongzhou Yang, Benjamin Martens, Zhiping Luo, Dan Xu, Jiye Fang and Shouzhong Zou, "Pt-Cu Nanoctahedra: Synthesis and Comparative Study with Nanocubes on Their Electrochemical Catalytic Performance", *Chem. Sci.,* **2012,** 3, 3302-3306.

65. Jianbo Zeng, Deok-Im Jean, Chunxin Ji, and Shouzhong Zou, "Nafion Ionomer Adsorption on Au and Pt Electrodes Studied by in-situ Surface-enhanced Raman Spectroscopy", *Langmuir,* **2012**, 28, 957-964.

64. Lin Dai and Shouzhong Zou, "Enhanced formic acid oxidation on PdCu alloy particles", *J. Power Sources*, **2011**, 196, 9369 - 9372.

63. Jian He, Jason Crase, Shriya Wadumethrige, Khushabu Thakur, Lin Dai, Shouzhong Zou, Rajendra Rathore, Christopher Hartley, "ortho-Phenylenes: Unusual Conjugated Oligomers with a Surprisingly Long Effective Conjugation Length", *J. Am. Chem. Soc.*, **2010**, 132, 13848-13857.

62. Yuqing Yang and Shouzhong Zou, "Electrooxidation of Carbon Monoxide on Pd Thin Film-Coated Au Electrodes – Film Thickness Dependence", *J. Electrochemistry* (special issue), **2010**, 16, 279-284.

61. Jun Zhang, Hongzhou Yang, Kai Sun, Jiye Fang, and Shouzhong Zou, "Enhancing by weakening: Electrooxidation of methanol on Pt_3Co and Pt nanocubes", *Angew. Chem. Int. Ed.,* **2010**, 49, 6848.

60. Hongzhou Yang, Lin Dai, Dan Xu, Jiye Fang, and Shouzhong Zou, "Electrooxidation of Methanol and Formic Acid on PtCu Nanoparticles", *Electrochim. Acta*, **2010**, 55, 8000 – 8004.

59. Jun Zhang, Hongzhou Yang, Jiye Fang, and Shouzhong Zou, "Synthesis and oxygen reduction activity of shape-controlled Pt_3Ni nanopolyhedra", *Nano Lett*., **2010**, 10, 638.

58. Jun Zhang, Hongzhou Yang, Kaikun Yang, Jiye Fang, Shouzhong Zou, Zhiping Luo, Howard Wang, In-Tae Bae, and Dae Young Jung, "Monodisperse Pt_3Fe Nanocubes: Synthesis, Characterization, Electrocatalytic Activity and Self-Assembly", *Adv. Funct. Mater*., **2010**, 20, 3727-3733.

57. Bin Geng, Jun Cai, Shao-Xiong Liu, Pu Zhang, Zhi-Qiang Tang, Dong Chen, Qian Tao, Yan-Xia Chen*, and Shou-Zhong Zou, "Temperature Programmed Desorption – An Application to Kinetic Studies of CO Desorption at Electrochemical Interfaces" *J. Phys. Chem. C,* **2009**, 113, 20152-20155.

56. Hongzhou Yang, Jun Zhang, Sachin Kumar, Haijun Zhang, Rudong Yang, Jiye Fang and Shouzhong Zou, "Monodisperse and highly active PtNi nanoparticles for O_2 reduction", *Electrochem.Comm.,* **2009**, 11, 2278-2281.

55. "Electroanalytical Measurements at Electrodes Modified with Metal Nanoparticles" James A. Cox and Shouzhong Zou, in "Trace Analysis with Nanomaterials", David Pierce and Julia X. Zhao, Ed., Wiley VCH, Weinheim, Chapter 11, **2010**.

54. "Solution-Based Evolution of Monodisperse PtCu Nanocubes and Their Enhanced Methanol Oxidation Activity", Dan Xu, Zhaoping Liu, Hongzhou Yang, Qingsheng Liu, Jun Zhang, Jiye Fang, Shouzhong Zou, and Kai Sun, *Angew. Chem. Int. Ed.,* **2009**, 48, 4217-4221.

53. "Carbon monoxide electrooxidation on uniform arrays of Au nanoparticles: effects of particle size and interparticle distance", S. Kumar and S. Zou, *Langmuir,* **2009**, 25, 574-581.

52. "Vertically aligned ZnO rods with multi-stage terrace structure and their improved solar cell efficiency", R. Zhang, Lei Kerr, S. Kumar, and S. Zou, *Crystal Growth & Design*, **2008**, 8, 381-383.

51. "Surface-enhanced Raman Studies of CO and Methanol oxidation on Ru Decorated Pt Thin Films", H. Yang, Y. Yang and S. Zou, *J. Phys. Chem. C*., **2007**, 111, 19058-19065.

50. "Seed-mediated growth of uniform gold nanoparticle arrays", S. Kumar, H. Yang and S. Zou, *J. Phys. Chem. C*, **2007**, 111, 12933-12938.

49. "Carbon monoxide and methanol oxidation on Pt thin film coated Au nanoparticle ensemble electrodes", S. Kumar, S. Zou, *Langmuir,* **2007***,* 23, 7365.

48. "Surface-enhanced Raman spectroscopic evidence of methanol oxidation on Ru electrodes", H. Yang, Y. Yang and S. Zou, *J. Phys. Chem. B*, **2006**, 110, 17296.

47. “Electroreduction of O_2 on uniform arrays of Pt and PtCo nanoparticles”, S. Kumar, S. Zou, *Electrochem. Comm.*, **2006**, 8, 1151-1157.

46. “Surface-enhanced Raman spectroscopy studies of 1,4-phenylene diisocyanide adsorption on Au and Pt-group transition metals”, S. Gruenbaum, M. Henney, S. Kumar, S. Zou, *J. Phys. Chem. B*, **2006**, 110, 4782.

45. “Coupled surface-enhanced Raman spectroscopy and electrical conductivity study of 1, 4-phenylene diisocyanide in molecular electronic junctions”, A. Jaiswal, K. Tavakoli, S. Zou, *Anal. Chem.*, **2006**, 78, 120.

44. “Orientation change of adsorbed pyrazine on roughened rhodium electrodes as probed by surface-enhanced Raman spectroscopy”, L. Cui, Z. Liu, S. Duan, D.Y. Wu, B. Ren, Z.Q. Tian, S. Zou, *J. Phys. Chem. B*, **2005**, 109, 17597.

43. “Electrooxidation of Carbon Monoxide on Gold Nanoparticle Ensemble Electrodes – Effects of Particle Coverage”, S. Kumar, S. Zou, *J. Phys. Chem. B*, **2005**, 109, 15707.

42. “Electrochemical and Surface-enhanced Raman Spectroscopy Investigation of CO and SCN^- Adsorbed on Au_{core}-Pt_{shell} Nanoparticles Supported on GC Electrodes”, B. Zhang, Q.-L. Zhong, B. Ren, Z.-Q. Tian, **S. Zou**, *Langmuir*, **2005**, 21, 7449.

41. “Molecular Recognition of Oxygen by Protein Mimics: Dynamics on the Femtosecond to Microsecond Time Scale”, **S. Zou**, J. S. Baskin, A. H. Zewail, *P. Natl. Acad. Sci. USA,* **2002**, 99, 9625.

40. “Attachment of Cobalt “Picket-Fence” Porphyrin to the Surface of Gold Electrodes Coated with 1-(10-mercaptodecyl)imidazole”, **S. Zou**, R.S Clegg, F.C. Anson, *Langmuir*, **2002**, 18, 3241.

39. "Surface-Enhanced Raman Scattering from Substrates with Conducting or Insulator Overlayers: Electromagnetic Model Predictions", S.A. Wasileski, **S. Zou**, M.J. Weaver, *Appl. Spectrosc.*, **2000**, 54, 761.

38. "Electrochemical Adsorbate-Induced Substrate Restructuring: Gold(110) in Aqueous Bromide Electrolytes", **S. Zou**, X. Gao, M.J. Weaver, *Surf. Sci.*, **2000**, 452, 44.

37. "The New Interfacial Ubiquity of Surface-Enhanced Raman Spectroscopy", M.J. Weaver, **S. Zou**, H.Y.H. Chan, *Anal. Chem.*, **2000**, 72, 38A.

36. "Mechanistic Differences between Electrochemical and Gas-Phase Thermal Oxidation of Platinum-Group Transition Metals as Discerned by Surface-Enhanced Raman Spectroscopy", H.Y.H. Chan, **S. Zou**, M.J. Weaver, *J. Phys. Chem. B*, **1999**,103, 11141.

35. "Spatial Structure of Ordered Electrochemical Adlayers From In-Situ Scanning Tunneling Microscopy and Infrared Spectroscopy: Single-Site Carbon Monoxide Binding

on Iridium(111) and Comparison with Related Systems" **S. Zou**, M.J. Weaver, *Surf. Sci.*, **2000**, 446, L95.

34. "Encapsulation of Neutral Gold Nanoclusters by Resorcinarenes", K.B. Stavens, S.V. Pusztay, **S. Zou**, R.P. Andres, and A. Wei, *Langmuir*, **1999**, 15, 8337.

33. "Surface Enhanced Raman Spectroscopic Characterization of Cadmium Sulfide/Cadmium Selenide Superlattices Formed on Gold by Electrochemical Atomic-Layer Epitaxy", **S. Zou**, and M.J. Weaver, *Chem. Phys. Lett.*, **1999**, 312, 101.

32. "Formation and Stability of Oxide Films on Platinum-Group Metals in Eletrochemical and Related Environments as Probed by Surface-Enhanced Raman Spectroscopy: Dependence on the Chemical Oxidant", **S. Zou**, H.Y.H. Chan, C.T. Williams, and M.J. Weaver, *Langmuir*, **2000**, 16, 754.

31. "In-Situ Scanning Tunneling Microscopy of Ir(100) Electrodes with Adsorbed Nitric Oxide and Carbon Monoxide", **S. Zou**, *Electrochem. Soc. Interface*, **1999**, 8, 59.

30. "Infrared Spectroscopy of Carbon Monoxide and Nitric Oxide on Palladium (111) in Aqueous Solution: Unexpected Adlayer Structure Differences between Electrochemical and Ultrahigh-Vacuum Interfaces", **S. Zou**, R. Gomez, and M.J. Weaver, *J. Electroanal. Chem.*, **1999**, 474, 155.

29. "Surface-Enhanced Raman Scattering of Ultrathin Cadmium Chalcogenide Films on Gold Formed by Electrochemical Atomic-Layer Epitaxy: Thickness-Dependent Phonon Characteristics", **S. Zou** and M.J. Weaver, *J. Phys. Chem. B*, **1999**, 103, 2323.

28. "Coverage-Dependent Infrared Spectroscopy of Carbon Monoxide on Palladium(100) in Aqueous Solution: Adlayer Phase Transitions and Electrooxidation Pathways", **S. Zou**, R. Gomez, M.J. Weaver, *Langmuir*, **1999**, 15, 2931.

27. "New Strategies for Surface-Enhanced Raman Scattering at Transition-Metal Interfaces: Thickness-Dependent Characteristics of Electrodeposited Pt-Group Films on Gold and Carbon", **S. Zou**, M.J. Weaver, X.Q. Li, B. Ren, and Z.Q. Tian, *J. Phys. Chem. B*, **1999**, 103, 4218.

26. "A Concerted Assessment of Potential-Dependent Vibrational Frequencies for Nitric Oxide and Carbon Monoxide on Low-Index Platinum-Group Surfaces in Electrochemical Compared with Ultrahigh Vacuum Environments: Structural and Electrostatic Implications", M.J. Weaver, **S. Zou**, and C. Tang, *J. Chem. Phys.*, **1999**, 111, 368.

25. "Adsorbate Bonding and Reactivity in Electrochemistry: Some Vibrational Spectroscopic Links to Surface Science and Interfacial Chemistry", M.J. Weaver and **S. Zou**, in "Interfacial Electrochemistry", A Wieckowski, ed, Marcel Dekker, New York, Chapter 18, 1999.

24. "Coadsorbate Vibrational Interactions within Mixed Carbon Monoxide-Nitric Oxide Adlayers on Ordered Low-Index Platinum-Group Electrodes", C. Tang, **S. Zou**, S-C. Chang, M.J. Weaver, *J. Electroanal. Chem.*, **1999**, 467, 92.

23. "Infrared Spectroscopy of Mixed Nitric Oxide-Carbon Monoxide Adlayers on Ordered Iridium (111) in Aqueous Solutions: A Model Study of Coadsorbate Vibrational Interactions", C. Tang, **S. Zou**, M.W. Severson, and M.J. Weaver, *J. Phys. Chem. B*, **1998**, 102, 8546.

22. "Coverage-Dependent Infrared Spectroscopy of Carbon Monoxide on Iridium (111) in Aqueous Solution: A Benchmark Comparison between Chemisorption in Ordered Electrochemical and Ultrahigh-Vacuum Environments", C. Tang, **S. Zou**, and M.J. Weaver, *J. Phys. Chem. B*, **1998**, 102, 8796.

21. "Direct Demonstration of Infrared Band Intensity Transfer between Coadsorbates having Widely Separated Oscillator Frequencies: Intermixed NO/CO Adlayers on Ordered Iridium Electrodes", M.J. Weaver, C. Tang, **S. Zou**, and M.W. Severson, *J. Chem. Phys.,* **1998**, 109, 4135.

20. "Surface-Enhanced Raman Scattering as a Versatile Vibrational Probe of Transition-Metal Interfaces: Benzene and Related Chemisorbates on Platinum-Group Electrodes", **S. Zou**, C.T. Williams, E.K-Y. Chen, and M.J. Weaver, *J. Phys. Chem. B*, **1998**, 102, 9039.

19. "Interactions within Mixed NO/CO Adlayers at the Pt(100)-Aqueous Electrochemical Interface as Probed by Infrared Spectroscopy", C. Tang, **S. Zou**, and M.J. Weaver, *Surf. Sci.*, **1998**, 412/3, 344.

18. "Surface-Enhanced Raman Scattering on Uniform Transition-Metal Films: Towards a Versatile Adsorbate Vibrational Strategy for Solid/Non-Vacuum Interfaces?", **S. Zou** and M.J. Weaver, *Anal. Chem.*, **1998**, 70, 2387.

17. "Surface Potentials of Metal-Gas Compared with Analogous Electrochemical Interfaces as Probed by Adsorbate Vibrational Frequencies", M.J. Weaver, C.T. Williams, **S. Zou**, H.Y.H. Chan, and C.G. Takoudis, *Catal. Lett.*, **1998**, 52, 181.

16. "Probing Molecular Vibrations at Catalytically Significant Interfaces: A New Ubiquity of Surface-Enhanced Raman Scattering", **S. Zou**, C.T. Williams, E. K-Y. Chen, and M.J. Weaver, *J. Am. Chem. Soc.*, **1998**, 120, 3811.

15. "Nanoscale Phenomena in Surface Electrochemistry: Some Insights from Scanning Tunneling Microscopy and Infrared Spectroscopy", **S. Zou**, I. Villegas, C. Stuhlmann, and M.J. Weaver, *Electrochim. Acta*, **1998**, 43, 2811.

14. " Infrared Spectroscopy of Carbon Monoxide at the Ordered Palladium (110) - Aqueous Interface: Evidence for Adsorbate-Induced Reconstruction", **S. Zou**, R. Gomez, and M.J. Weaver, *Surf. Sci.*, **1998**, 399, 270.

13. "Nitric Oxide and Carbon Monoxide Adsorption on Polycrystalline Iridium Electrodes: A Combined Raman and Infrared Spectroscopic Study", **S. Zou**, R. Gomez, and M.J. Weaver, *Langmuir*, **1997**, 13, 6713.

12. "Vibrational Spectroscopy of Electrochemical Interfaces: Some Walls and Bridges to Surface Science Understanding", M.J. Weaver and **S. Zou**, for *"Advances in Spectroscopy"*, Vol. 26,*"Spectroscopy for Surface Science"*, R.J.H. Clark and R. E. Hester, eds., Wiley, 1998, Chapter 5.

11. "Potential-Dependent Metal-Adsorbate Stretching Frequencies for Carbon Monoxide on Transition-Metal Electrodes: Chemical-Bonding versus Electrostatic-Field Effects", **S. Zou** and M.J. Weaver, *J. Phys. Chem.*, **1996**, 100, 4237.

10. "SERS Studies of Electrode/Electrolyte Interfacial Water: II. Librations of Water and Electrochemical Hydrogen Evolution Reaction", Y.X. Chen, **S.Z. Zou**, K.Q. Huang, and Z.Q. Tian, *J. Raman Spectrsc.*, **1998**, 29, 749.

9. "SERS Studies on Electrode/Electrolyte Interfacial Water: I. Ion Effects in the Negative Potential Region", **S.Z. Zou**, Y.X. Chen, B.W. Mao, B. Ren, and Z.Q. Tian, *J. Electroanal. Chem.*, **1997**, 424, 19.

8. "Potential-Averaged Surface-Enhanced Raman Spectroscopy", Z.Q. Tian, W.H. Li, B.W. Mao, **S.Z. Zou**, and J.S. Gao, *Appl. Spectrosc.*, **1996**, 50, 1569.

7. "Probing Electrode/Electrolyte Interfacial Structure in the Potential Region of Hydrogen Evolution by Raman Spectroscopy", Z.-Q. Tian, B. Ren, Y.-X. Chen, **S.-Z. Zou**, and B.-W. Mao, *J. Chem. Soc., Faraday Trans.*, **1996**, 92, 3829.

6. "Studies on the Effects of Inorganic Ions and Their Concentrations on Raman Spectra of Water", **S. Zou**, Y. Chen, Z. Tian, and Y. Zhang, *Wuli Huaxue Xuebao (Acta Physico-Chimica Sinica)*, **1996**, 12, 130.

5. "Can Adsorption Be Studied in the Electrode Potential Range of Severe Hydrogen Evolution", W.H. Li, **S.Z. Zou**, B. Ren, and Z.Q. Tian, *Chin. Chem. Lett.*, **1996**, 7, 165.

4. "Extending SERS Activity at Silver Electrodes at a Wide Potential Region", **S. Zou**, J. Gao, C. Li, and Z. Tian, *Wuli Huaxue Xuebao (Acta Physico-Chimica Sinica)*, **1995**, 11, 1020.

3. "SERS Studies on the Orientation Structure of Adsorbed Water at Ag Electrodes - Effects of Electrode Potential and $NaClO_4$ Concentrations", **S.-Z. Zou**, Y.-H. Zhang, Y.-X. Chen, and Z.-Q. Tian, *Gaodeng Xuexiao Huaxue Xuebao (Chem. J. Chinese Univ.)*, **1995**, 16, 245.

2."The Observation of SERS of Water in a Wide Potential Range from the Ag/$NaClO_4$ System", Z.Q. Tian, S.K. Sigalaev, **S.Z. Zou**, B.W. Mao, A.M. Funtikov, and V.E. Kazarinov, *Electrochim. Acta*, **1994**, 39, 2195.

1. "Time Resolved In-Situ Raman Spectroscopic Studies of SCN^- Adsorption on Ag Electrodes", J.-S. Gao, G. Xue, W.-H. Li, **S.-Z. Zou**, and Z.-Q. Tian, *Chinese J. Light Scattering*, **1993**, 5, 73.

Presentations:

A. Invited Seminars

30. "Electrocatalysis on Metal Nanocrystals – Back to the future", March 8, 2019. Department of Chemistry and Biochemistry, George Mason University.

29. "Electrocatalysis on Metal Nanocrystals – Back to the future", June 9, 2014. Department of Chemistry and State Key Laboratory of Physical Chemistry of Solid Surfaces, Xiamen University, Xiamen, China.

28. "Electrocatalysis on Metal Nanocrystals – Back to the future", April 24, 2014. Department of Chemistry and Biochemistry, Miami University, Oxford, OH.

27. "Electrocatalysis on Metal Nanocrystals", May 26, 2013. Department of Chemistry, Tianjin University, Tianjin, China.

26. "Tackling Challenges in Fuel Cell Development with Nanotechnology", November 29, 2010, Department of Chemistry, George Washington University, Washington DC.

25. "Improving Fuel Cell Performance through Nanotechnology", May 31, 2010, Department of Chemistry, Fudan University, Shanghai, China.

24. "Improving Fuel Cell Performance through Nanotechnology", May 28, 2010, Department of Chemistry, Suchow University, Suzhou, China.

23. "Tackling Challenges in Fuel Cell Development with Nanotechnology", May 26, 2010, Department of Chemical Physics, University of Science and Technology of China, Hefei, China.

22. "Electrocatalysis on Structure Controlled Pt-alloy Nanocrystals", March 8, 2010, Metallurgy Division Seminar, National Institute of Standards and Technology.

21. "Improving the Performance of Proton Exchange Membrane Fuel Cells through Nanotechnology", December 08, 2009, Department of Chemistry, Georgetown University, Washington DC.

20. “Improving the Performance of Proton Exchange Membrane Fuel Cells through Nanotechnology”, August 12, 2009, Department of Chemical Physics, University of Science and Technology of China, Hefei, China.

19. “Electrocatalysis on nanoparticle arrays and monolayer thin films: Unravel the structure-reactivity relationships” May 01, 2009, Department of Chemistry, SUNY Binghamton, Binghamton, NY.

18. “Electrocatalysis on Uniform Nanoparticle Arrays and Monolayer Films: Unravel the Structure-Reactivity Relationships”, October 29, 2008, Fuel Cell Activities, General Motors, Honeoye Falls, NY.

17. “Synthesis and Applications of Uniform Two-dimensional Nanoparticle Arrays”, April 22, 2008, Center for Nanoscale Science and Technology, National Institute of Standards and Technology.

16. “Electrocatalysis on Uniform Nanoparticle Arrays and Monolayer Films: Unravel the Structure-Reactivity Relationships”, April 04, 2008, Department of Chemistry, Cleveland State University, Cleveland, OH.

15. “Electrocatalysis on Uniform Nanoparticle Arrays and Monolayer Films: Unravel the Structure-Reactivity Relationships”, November 16, 2007, Department of Chemistry, University of Louisville, Louisville, KY.

14. “Electrocatalysis on Uniform Nanoparticle Arrays and Monolayer Films: Unravel the Structure-Reactivity Relationships”, October 10, 2007, Department of Chemistry, Beijing Institute of Technology, Beijing, China.

13. “Uniform Two-dimensional Nanoparticle Arrays – A platform for many things”, October 09, 2007, State Key Laboratory of Physical Chemistry of Solid Surfaces, Department of Chemistry, Xiamen University, Xiamen, China.

12. “Electrocatalysis on Uniform Nanoparticle Arrays and Monolayer Films: Unravel the Structure-Reactivity Relationships”, April 19, 2007, Department of Chemistry and Biochemistry, Miami University, Oxford, OH

11. “Electrocatalysis on Metal Uniform Nanoparticle Arrays and Monolayer Films: Unravel the Structure-Reactivity Relationships”, April 05, 2007, Department of Chemistry, Case Western Reserve University, Cleveland, OH.

10. “Electrocatalysis on Metal Uniform Nanoparticle Arrays and Monolayer Films: Unravel the Structure-Reactivity Relationships”, April 02, 2007, Physical Chemistry Division Seminar, Department of Chemistry, Ohio State University, Columbus, OH.

9. “Electrocatalysis on Metal Uniform Nanoparticle Arrays and Monolayer Films: Unravel the Structure-Reactivity Relationships”, March 14, 2007, Department of Chemistry, West Virginia University, Morgantown, WV.

8. “Electrocatalysis on Metal Uniform Nanoparticle Arrays and Monolayer Films: Unravel the Structure-Reactivity Relationships”, October 26, 2006, Department of Chemistry and Biochemistry, Auburn University, Auburn, AL.

7. “Electrocatalysis on Metal Uniform Nanoparticle Arrays and Monolayer Films: Unravel the Structure-Reactivity Relationships”, October 25, 2006, Department of Chemistry, University of Georgia, Athens, GA.

6. “Electrocatalysis on Metal Uniform Nanoparticle Arrays and Monolayer Films: Unravel the Structure-Reactivity Relationships”, October 24, 2006, Department of Chemistry, Clemson University, Clemson, SC.

5. “Electrocatalysis on Metal Uniform Nanoparticle Arrays and Monolayer Films: Unravel the Structure-Reactivity Relationships”, October 09, 2006, Department of Chemistry, Western Michigan University, Kalamazoo, MI.

4. “Electrocatalysis on Metal Uniform Nanoparticle Arrays and Monolayer Films: Unravel the Structure-Reactivity Relationships”, September 05, 2006, Analytical Division seminar, Department of Chemistry, Purdue University, West Lafayette, IN.

3. “Electrocatalysis on Nanoparticle Arrays and Thin Films - New Insights for Direct Methanol Fuel Cell Development”, April 12, 2006, Department of Chemistry, Oakland University, Auburn Hill, MI.

2. “Electrochemistry: From methanol fuel cell to molecular electronics”, April 05, 2006, Department of Chemistry, Georgetown University, Washington DC.

1. “Electrocatalysis on Nanostructured Surfaces – Implications to Methanol Fuel Cells”, April 07, 2005, Department of Chemistry, Knox College, Galesburg, IL.

B. Professional Conferences

47. “Co,N-Codoped Mesoporous Carbon As Efficient Bifunctional Catalysts for Oxygen Reduction and Hydrogen Evolution Reaction”, 232nd ECS meeting, National Harbor, MD, October 3, 2017.

46. “Electrocatalysis on Metal Nanocrystals – Back to the future”, 7th Forum of Chemistry Innovation and Development, Chinese Science Press, Xiamen, China. June 25, 2017

45. “PtNi nano-crystals as high performance catalysts for oxygen reduction reaction”, International Conference on Catalysis and Chemical Engineering, Baltimore, MD, February 22-24, 2017.

44. “Concave PtNi Nano-Octahedra as High Performance Catalysts for Oxygen Reduction Reaction”, 3rd Zing Hydrogen & Fuel Cells Conference, Cancun, Mexico, November 17-20, 2015.

43. “Formic Acid Oxidation on Pd Thin Film Coated Au Nanocrystals”, Electrochemistry Gordon Conference, Ventura, CA. January 4 – 10, 2014.

42. “Electrocatalysis on Cubic Pt-M Alloy Nanocrystals”, 86th ACS Colloid & Surface Science Symposium, Baltimore, MD, June 10 – 13, 2012.

41. “Electrocatalysis on Cubic Pt-M Alloy Nanocrystals”, 11th ISE Spring Meeting, Washington DC, May 23 – 25, 2012.

40. “Uniform Arrays of SiO_2@Au Core-Shell Particles for In-Situ Surface-enhanced Raman Spectroscopy: Extension to Pt Group Metals”, 219th Annual Meeting of the Electrochemical Society, Montreal, Canada, May 1 – 6, 2011.

39. “Electrocatalysis on Facet-Controlled Pt-alloy Nanocrystals”, 37th FACSS meeting, Raleigh, NC. October 17 – 21, 2010.

38. “Electrocatalysis on Facet-Controlled Pt-alloy Nanocrystals”, 61st ISE meeting, Nice, France. September 26 – October 1, 2010.

37. “Electrocatalysis on Facet-Controlled Pt-alloy Nanocrystals”, 12th International Conference on Electrified Interfaces, Geneva, NY. June 20 – 25, 2010.

36. “Size and shape controlled Pt-alloy nanoparticles as fuel cell catalysts”, 216th Annual Meeting of the Electrochemical Society, Vienna, Austria. October 4 – 9, 2009.

35. “Size and shape controlled Pt-M alloy nanoparticles for fuel cell catalysts”, 60th Annual Meeting of International Society of Electrochemistry, Beijing, China. August 16 – 22, 2009.

34. Invited talk – “Size and shape controlled Pt-M alloy nanoparticles for fuel cell catalysts”, Central Regional ACS Meeting, Cleveland, OH. May 20 – 23, 2009.

33. Invited talk – “Improving the Performance of Proton Exchange Membrane Fuel Cells through Nanotechnology”, Ohio Innovation Summit, Dayton, OH. April 20 – 23, 2009.

32. Invited talk – “Synthesis and Applications of Uniform Two-dimensional Nanoparticle Arrays”, Central Regional ACS Meeting, Columbus, OH. June 11 – 13, 2008.

31. Invited talk – “Synthesis and Applications of Two Dimensional Nanoparticle Arrays”, Southeastern Regional ACS Meeting, Greenville, SC. October 24 – 27, 2007.

30. Invited talk – “New Insights for Methanol Oxidation on Ru-Modified Pt from in-situ Surface-enhanced Raman Spectroscopy”, with Hongzhou Yang and Yuqing Yang. The 35th Colloquium Internationale, Xiamen, China. September 24 – 27, 2007.

29. Poster presentation – “Uniform metal nanoparticle arrays as model electrocatalysts for fuel cells” with Sachin Kumar and Hongzhou Yang. Fuel Cells Gordon Research Conference, Smithfield, RI, July 22 – 27, 2007

28. Poster presentation – "Growth and Electrocatalysis of Shape Controlled Au Nanoparticle Arrays" with Sachin Kumar and Hongzhou Yang, presented by Sachin Kumar, 3rd Ohio Nanotech Summit 2007, Akron, OH, April 24-25, 2007.

27. Poster presentation – “Growth and Characterization of Novel ZnO Nanocones” with Hongzhou Yang and Sachin Kumar. Presented by Hongzhou Yang. Pittcon., Chicago, IL, February 25 – March 2, 2007.

26. Poster presentation – “Surface-enhanced Raman spectroscopy studies of carbon monoxide and methanol electrooxidation on Ru decorated Pt thin films”, Electrochemistry Gordon Research Conference, Ventura, CA, January 14 – 19, 2007.

25. Oral presentation – “Surface-Enhanced Raman Spectroscopic Studies of CO and Methanol Electrooxidation on Ru Modified Pt Surfaces”, 231st American Chemical Society Meeting, Atlanta, GA, March 26 – 30, 2006.

24. Poster – “Surface-enhanced Raman spectroscopy studies of carbon monoxide and methanol electrooxidation on Ru decorated Pt thin films”, with Hongzhou Yang and Yuqing Yang. Pittsburgh Conference, Orlando, FL, March 12 - 17, 2006.

23. Poster – “ Carbon monoxide and methanol oxidation on sulfur-modified Pt(111) and polycrystalline Pt”, with Mathew Mattox and Hongzhou Yang, presented by Mathew Mattox at Pittsburgh Conference, Orlando, FL, March 12 - 17, 2006.

22. Poster and oral presentation – “Electrocatalysis on uniform arrays of nanoparticles”, Gordon Research Conference on Electrochemistry, Buellton, CA, February 12 – 17, 2006.

21. Oral presentation – “Electrooxidation of carbon monoxide on S-modified Pt Electrodes”, Midwestern Universities Analytical Chemistry Conference (MUACC), Oxford, OH, October 14 – 15, 2005.

20. Oral presentation – “Electrocatalysis at Uniform Arrays of Nanoparticles”, First E. B. Yeager Frontiers of Electrochemical Sciences and Technology, Cleveland, OH, Oct. 12-14, 2005.

19. Oral presentation – "Electrocatalysis at Uniform Arrays of Nanoparticles" with S. Kumar, Y. Yang. 207th Electrochemical Society Meeting, Quebec City, Canada, May 15 – 20, 2005.

18. Oral presentation – "Surface-enhanced Raman Spectroscopy Studies of 1,4-Phenylene Diisocyanide Adsorption on Platinum-Group Transition Metal Surfaces" with S. Gruenbaum, M. Henney and S. Kumar. PittCon 2005, Orlando, FL, February 26 – March 4, 2005.

17. Poster – "Coupled surface-enhanced Raman spectroscopy and electrical conductivity study of 1, 4-phenylene diisocyanide in molecular electronic junctions" with A. Jaiswal and K. Tavakoli, Gordon Research Conference on Electrochemistry, Ventura, CA, February 20 – 25, 2005.

16. Oral presentation – "Promoting CO Oxidation on Pt by Sulfur", Gordon Research Conference on Electrochemistry, Ventura, CA, February 20 – 25, 2005.

15. Oral presentation – "Vibrational Spectroscopic Studies of Molecules in Molecular – Electronic Junctions", Midwestern Universities Analytical Chemistry Conference (MUACC), Columbus, OH, October 14 – 16, 2004.

14. Oral presentation – "Surface-enhanced Raman Spectroscopy Studies of 1,4-Phenylene Diisocyanide Adsorption on Platinum-Group Transition Metal Surfaces" with S. Gruenbaum, M. Henney and S. Kumar, 206th Electrochemical Society meeting, Honolulu, Oct. 03 – 08, 2004.

13. Oral presentation – "Promoting Carbon Monoxide Electrooxidation on Platinum and Rhodium by Adsorbed Sulfur" with M. Mattox, M. Henney and A. Johnson, 206th Electrochemical Society meeting, Honolulu, Oct. 03 – 08, 2004.

12. Poster – "Single Molecular Wires and Electronic Devices Based on Dimetal Complexes Containing Metal-Metal Bonds" with Thomas Scott and Hong-Cai Zhou, 36th Central Regional ACS Meeting, Indianapolis, IN, June 03 – 04, 2004.

11. Poster – "Single-Molecular Wires and Electronic Devices Based on Dimetal Complexes Conatining Metal-Metal Bonds" with Thomas Scott and Hong-Cai Zhou, Nanotechnology Symposium, Miami University, November 13 – 14, 2003.

10. Poster – "The Adsorption of 1,4 – Phenylene Diisocyanide on Metal Surfaces", with Scott Gruenbaum and Matthew W. Henney, Nanotechnology Symposium, Miami University, November 13 – 14, 2003.

9. Oral presentation – "Probing local chemical properties on a nanometer scale by tip-enhanced Raman spectroscopy", Midwestern Universities Analytical Chemistry Conference (MUACC), Indianapolis, IN, October 10 – 11, 2003.

8. Poster – “Assembly of Metal Nanoparticles with Well-Defined Surfaces on Gold”, Miami University Nano Symposium, May, 2003.

7. Oral Presentation – “New applications of overlayer surface-enhanced Raman spectroscopy”, 225th ACS national meeting, New Orleans, March, 2003.

6. Oral presentation - “The Interfacial Versatility of SERS: New Applications in Surface Chemistry and Materials Science”, Progress in Surface Raman Spectroscopy, a Satellite Meeting of the 17th International Conference on Raman Spectroscopy (ICORS), Xiamen University, Xiamen, China, August, 2000.

5. Poster - "New Directions in Surface-Enhanced Raman Spectroscopy", Gordon Research Conference on Electrochemistry, Ventura, CA, January, 1999.

4. Awardee address - "Vibrational Spectroscopic Studies of Electrochemical Interfacial Bonding and Structure", Pharmacia-Upjohn Co., Kalamazoo, MI, December, 1998.

3. Oral Presentation - "Probing Molecular/Atomic Interactions and Structure at Electrochemical Interfaces", Physical Chemistry Division Seminar, Chemistry Department, Purdue University, West Lafayette, IN, December, 1998.

2. Oral Presentation - "In-Situ Scanning Tunneling Microscopy Studies of Au(110) Electrode Restructuring", AVS Prairie Chapter 1997 Spring Meeting, Purdue University, West Lafayette, IN, May, 1997.

1. Oral Presentation - "Carbon Monoxide-Induced Reconstruction of Pd(110) Surfaces as Probed by Infrared Spectroscopy", 1997 Graduate Student Symposium of the Electrochemical Society, Chicago Section, University of Illinois at Chicago, Chicago, IL, April, 1997.

Meetings Organized

1. “Electrodeposition for Energy Applications2” symposium, 219th ECS national meeting, Montreal, Canada, May 1 – 6, 2011.

2. “Nanotechnology” sessions, 37th Meeting of the Federation of Analytical Chemistry and Spectroscopy Societies, Raleigh, NC. October 17 - 21, 2010.

3. “Electrocatalysis” sessions, Central Regional ACS Meeting, Cleveland, OH. May 20 – 23, 2009.

4. “Electrodeposition for Energy Applications” symposium, 213rd ECS national meeting, Phoenix, AZ, May 18 – 22, 2008.

Courses Taught

1. Analytical Chemistry: Quantitative chemical analysis with chemical equilibrium and instrumental analysis for junior and senior year undergraduate students in BA majors.

2. *Analytical Chemistry Laboratory:* A laboratory course for quantitative chemical analysis with chemical equilibrium and instrumental analysis.

3. Instrumental Analysis: Instrumental analysis lecture course for junior and senior year undergraduate students in the Chemistry and Biochemistry BS programs, and graduate students with analytical chemistry as one of their secondary areas.

4. Chemical Measurements: instrumental lab for students pursuing a BS in Chemistry.

5. Electrochemical Methods for Analytical Chemistry: graduate level course for students with a primary research interest in analytical chemistry. This is a course developed by me.

6. Introduction to Nanoscience and Technology: special topic class for graduate students with interest in these areas. This is a course developed by me and has attracted students from Chemistry and Physics Departments.

7. *College Chemistry Laboratory*: this is a laboratory course for students in honors and chemistry and biochemistry majors programs.

8. *General Chemistry*: introductory chemistry course for first year undergraduate students.

9. *Experimental Biochemistry*: advanced senior capstone research lab course.