Curriculum Vitae

1. Name, position, academic department

Lai-Sheng Wang, *Jesse H. and Louisa D. Sharpe Metcalf* Professor of Chemistry

2. Education

B.S. in Chemistry, Wuhan University, China	August 1982
Ph.D. in Chemistry, University of California, Berkeley, CA	February 1990

3. Professional appointments

1983 – 1989	Research Assistant, Department of Chemistry, University of California, Berkeley
1990 – 1992	Post-doctoral Research Associate, Department of Chemistry, Rice University
1993 – 1998	Assistant Professor, Department of Physics, Washington State University
1998 – 2002	Associate Professor, Department of Physics, Washington State University
2002 – 2009	Professor, Department of Physics, Washington State University
2009 – 2015	Professor, Department of Chemistry, Brown University
2015 – present	Jesse H. and Louisa D. Sharpe Metcalf Professor of Chemistry, Brown University
2019 – present	Chair, Department of Chemistry, Brown University

4. Academic Honors and Recognitions

2023 Herbert P. Broida Prize, American Physical Society
2021 E. Bright Wilson Award in Spectroscopy, American Chemical Society.
2019 Distinguished Research Achievement Award, Brown University.
2016 Creativity Award, U.S. National Science Foundation
2015 The 19th Annual Lyle Ramsay Dawson Lecture, University of Kentucky, College of Arts and Sciences, Lexington, Kentucky.
2014 Plenary Lecturer, XXIII International Materials Research Conferences (IMRC 2014), Cancun, Mexico, August 17-21, 2014.
2014 JILA Visiting Fellow, University of Colorado, Boulder, CO. May 20 – June 5, 2014.
2014 Earle K. Plyler Prize for Molecular Spectroscopy & Dynamics, American Physical Society
2007 Elected AAAS Fellow
2007 Sahlin Faculty Excellence Award for Research, Scholarship & Arts, Washington State University
2006 Senior Humboldt Research Award
2005 John Simon Guggenheim Fellow
2005 Distinguished Faculty Award, College of Sciences, Washington State University
2003 Elected American Physical Society Fellow
2001 Creativity Award, U.S. National Science Foundation
1997 Westinghouse Distinguished Professor in Materials Science and Engineering
1997 Alfred P. Sloan Research Fellow
1996 NSF CAREER Award

5. Publications

a. Chapters in books

1. "A Comparative Study of the Electronic Structure of the First Row Transition Metal Clusters", (L. S. Wang and H. Wu), *Proc. Int. Symp. of the Sci. and Tech. of Atomically Engineered Materials* (Oct. 30-Nov. 4, 1995, Richmond, VA). Edited by P. Jena, S. N. Khanna, B. K. Rao (World Scientific, New Jersey, 1996), pp. 245-250.
2. "Probing the Electronic Structure of Transition Metal Clusters From Molecular to Bulk-like Using Photoelectron Spectroscopy", (L. S. Wang and H. Wu), ***Advances in Metal and Semiconductor Clusters. IV. Cluster***

Materials. Edited by M. A. Duncan (JAI Press, Greenwich, 1998), pp. 299-343.

3. "Quantum Mechanical Modeling of Structure Evolution of Transition Metal Clusters and Metallocarbohedrenes" (H. S. Cheng and L. S. Wang), **NATO Science Series E 360:** ***Implications of Molecular and Materials Structure for New Technologies***. Edited by J. A. K. Howard, F. H. Allen, and G. P. Shields (Kluwer Academic Publisher, Netherlands, 1999), pp. 135-150.
4. "Photodetachment Photoelectron Spectroscopy of Transition Metal Oxide Species", (L. S. Wang), ***Advanced Series in Physical Chemistry*, Vol. 10.** ***Photoionization and Photodetachment***. Edited by C. Y. Ng (World Scientific, Singapore, 2000), pp.854-957.
5. "Temperature Effects in Anion Photoelectron Spectroscopy of Metal Clusters" (L. S. Wang and X. Li), ***Clusters and Nanostructure Interfaces***. Edited by P. Jena, S. N. Khanna, and B. K. Rao (World Scientific, River Edge, New Jersey, 2000), pp. 293-300.
6. "Clusters", (L. S. Wang), ***Encyclopedia of Chemical Physics and Physical Chemistry.*** Edited by J. H. Moore and N. D. Spencer (IOP Publishing Inc., Philadelphia, 2001), pp.2113-2130.
7. "Probing the Electronic Structure of Fe-S Clusters: Ubiquitous Electron Transfer Centers in Metalloproteins Using Anion Photoelectron Spectroscopy in the Gas Phase" (X. Yang, X. B. Wang, Y. J. Fu, and L. S. Wang), ***Principles of Mass Spectrometry Applied to Biomolecules.*** Edited by J. Laskin and C. Lifshitz (Wiley, New Jersey, 2006), pp. 63-117.
8. "Probing the Unique Size-Dependent Properties of Small Au Clusters, Au Alloy Clusters, and CO-Chemisorbed Au Clusters in the Gas Phase" (H. J. Zhai, X. Li, and L. S. Wang), ***The Chemical Physics of Solid Surfaces. Vol. 12: Atomic Clusters from Gas Phase to Deposited.*** Edited by D. P. Woodruff (Elsevier, New York 2007), pp. 91-150.
9. "From Planar Boron Clusters to Borophenes and Borospherenes" (L. S. Wang), *Proc. SPIE* **10174**, *Int. Sym. on Clusters and Nanostructures*, 1017402 (December 21, 2016); doi: 10.1117/12.2254384.

b. Refereed journal articles

1. "Photoelectron Spectroscopy and Infrared Femtosecond Intramolecular Dynamics of $C_2H_2^+$ and $C_2D_2^+$" (J. E. Reutt, L. S. Wang, J. E. Pollard, D. J. Trevor, Y. T. Lee, and D. A. Shirley), *J. Chem. Phys.* **84**, 3022-3031 (1986).
2. "Molecular Beam Photoelectron Spectroscopy of $Ni(CO)_4$" (J. E. Reutt, L. S. Wang, Y.T. Lee, and D. A. Shirley), *Chem. Phys. Lett*. **126**, 399-404 (1986).
3. "Molecular Beam Photoelectron Spectroscopy and Femtosecond Intramolecular Dynamics of H_2O^+ and D_2O^+" (J. E. Reutt, L. S. Wang, Y. T. Lee, and D. A. Shirley), *J. Chem. Phys.* **85,** 6928-6939 (1986).
4. "Molecular Beam Photoelectron Spectroscopy: The $C_2D_4^+$ (X^2B_3) Ground State" (L. S. Wang, J. E. Pollard, Y. T. Lee, and D. A. Shirley), *J. Chem. Phys*. **86**, 3216-3218 (1987).
5. "Molecular Beam Photoelectron Spectroscopy of SO_2: Geometry, Spectroscopy and Dynamics of SO_2^+" (L. S. Wang, Y. T. Lee, and D. A. Shirley), *J. Chem. Phys*. **87**, 2489-2497 (1987).
6. "High Resolution UV Photoelectron Spectroscopy of CO_2^+, COS^+, and CS_2^+ Using Supersonic Molecular Beams" (L. S. Wang, J. E. Reutt, Y. T. Lee, and D. A. Shirley), *J. Electron Spectrosc. Relat. Phenom*. **47**, 167-186 (1988).
7. "Vibrational Spectra of Se_2^+ and Te_2^+ in Their Ground States" (L. S. Wang, B. Niu, Y. T. Lee, and D. A. Shirley), *Chem. Phys. Lett.* **158**, 297-300 (1989).
8. "Photoelectron Spectroscopy and Electronic Structure of Heavy Group IV-VI Diatomics" (L. S. Wang, B. Niu, Y. T. Lee, D. A. Shirley, and K. Balasubramanian), *J. Chem. Phys*. **92**, 899-908 (1990).
9. "High Temperature and High Resolution UV Photoelectron Spectroscopy Using Supersonic Molecular Beams" (L. S. Wang, J. E. Reutt-Robey, B. Niu, Y. T. Lee, and D. A. Shirley), *J. Electron Spectrosc. Relat. Phenom*. **51**, 513-526 (1990).
10. "High Resolution Photoelectron Spectroscopy of Clusters of Group V Elements" (L. S. Wang, B. Niu, Y. T. Lee, and D. A. Shirley), *Physica Scripta* **41**, 867-869 (1990).
11. "Electronic Structure and Chemical Bonding of the First Row Transition Metal Dichlorides: $MnCl_2$, $NiCl_2$, and $ZnCl_2$ – A High Resolution Photoelectron Spectroscopic Study" (L. S. Wang, B. Niu, Y. T. Lee, and D. A. Shirley, *J. Chem. Phys*. **93**, 957-966 (1990).
12. "Photoelectron Spectroscopy and Electronic Structure of Clusters of the Group V Elements. I. Dimers" (L. S. Wang, Y. T. Lee, D. A. Shirley, K. Balasubramanian, and P. Feng), *J. Chem. Phys*. **93**, 6310-6317 (1990).
13. "Photoelectron Spectroscopy and Electronic Structure of Clusters of the Group V Elements. II. Tetramers: Strong Jahn-Teller Coupling in the Tetrahedral ^2E Ground States of P_4^+, As_4^+, and Sb_4^+" (L. S. Wang, B. Niu, Y. T. Lee, D. A. Shirley, E. Ghelichkhani, and E. R. Grant), *J. Chem. Phys*. **93**, 6318-6326 (1990).
14. "Photoelectron Spectroscopy and Electronic Structure of Clusters of the Group V Elements. III. Tetramers: The

$^2T_2$ and $^2A_1$ Excited States of P_4^+, As_4^+, and Sb_4^+" (L. S. Wang, B. Niu, Y. T. Lee, D. A. Shirley, E. Ghelichkhani, and E. R. Grant), *J. Chem. Phys*. **93**, 6327-6333 (1990).

15. "Molecular Beam Photoelectron Spectroscopy of Allene" (Z. Z. Yang, L. S. Wang, Y. T. Lee, D. A. Shirley, S. Y. Huang, and W. A. Lester, Jr.), *Chem. Phys. Lett*. **171**, 9-13 (1990).
16. "Vibrational Autodetachment Spectroscopy of Au_6^-: Image-charge-bound states of a Gold Ring" (K. J. Taylor, C. Jin, J. Conceicao, L. S. Wang, O. Cheshnovsky, B. R. Johnson, P. J. Norlander, and R. E. Smalley), *J. Chem. Phys*. **93**, 7515-7518 (1990).
17. "Temperature Dependent ARPEFS study of c(2x2)Cl/Cu(001)", (L. Q. Wang, A. E. Schach von Wittenau, Z. Ji, L. S. Wang, Z. Q. Huang, and D. A. Shirley), *Phys. Rev*. **B44**, 1292-1305 (1991).
18. "Carbon Arc Generation of C_{60}", (R. E. Haufler, Y. Chai, L. Chibante, J. Conceicao, C. Jin, L. S. Wang, S. Maruyama, and R. E. Smalley), *Mat. Res. Soc. Symp. Proc*. **206**, 627-637 (1991).
19. "Fullerene Triplet State Production and Decay: R2PI Probes of C_{60} and C_{70} in a Supersonic Beam", (R. E. Haufler, L. S. Wang, L. P. F. Chibante, C. Jin, J. Conceicao, Y. Chai, and R. E. Smalley), *Chem. Phys. Lett*. **179**, 449-454 (1991).
20. "Threshold Photodetachment of Cold C_{60}^-", (L. S. Wang, J. Conceicao, C. Jin, and R. E. Smalley), *Chem. Phys. Lett*. **182**, 5-11 (1991).
21. "Electronic Structure of $K_xC_{60}^-$ in the Gas Phase", (L. S. Wang, O. Cheshnovsky, R. E. Smalley, J. D. Carpenter, and S. -J. Hwu), *J. Chem. Phys*. **96**, 4028-4031 (1992).
22. "Ultraviolet Photoelectron Spectroscopy and Photofragmentation studies of Excess Electrons in Potassium Iodide Cluster Anions", (Y. A. Yang, L. A. Bloomfield, C. Jin, L. S. Wang, and R. E. Smalley), *J. Chem. Phys*. **96**, 2453-2459 (1992).
23. "Photoelectron Spectroscopy and Electronic Structure of $Ca@C_{60}$", (L. S. Wang, J. M. Alford, Y. Chai, M. Diener, and R. E. Smalley), *Z. Phys. D - Atoms, Molecules and Clusters* **26**, 297-299 (1993).
24. "The Electronic Structure of $Ca@C_{60}$", (L. S. Wang, J. M. Alford, Y. Chai, M. Diener, G. E. Scuseria, and R. E. Smalley), *Chem. Phys. Lett*. **207**, 354-359 (1993).
25. "A Study of FeC_2 and FeC_2H by Anion Photoelectron Spectroscopy" (J. Fan and L. S. Wang), *J. Phys. Chem*. **98**, 11814-11817 (1994).
26. "Photoelectron Spectroscopy of Transition Metal Clusters: Correlation of Valence Electronic Structure to Reactivity", (J. Conceicao, T. Laaksonen, L. S. Wang, T. Guo, P. Nordlander, and R. E. Smalley), *Phys. Rev*. B **51**, 4668-4671 (1995).
27. "Probing the Electronic Structure of Small Iron Clusters", (L. S. Wang, H. S. Cheng, and J. Fan), *Chem. Phys. Lett.* **236**, 57-63 (1995).
28. "FeC_n^- and FeC_nH^- (n = 3, 4): A Photoelectron Spectroscopic and Density Functional Study", (J. Fan, L. Lou, and L. S. Wang), *J. Chem. Phys*. **102**, 2701-2707 (1995).
29. "$Si_3O_4^-$: Vibrationally Resolved Photoelectron Spectrum and *Ab Initio* Calculations", (J. Fan, J. B. Nicholas, J. M. Price, S. D. Colson, and L. S. Wang), *J. Am. Chem. Soc*. **117**, 5417-5418 (1995).
30. "A Combined Density Functional Theoretical and Photoelectron Spectroscopic Study of Ge_2O_2", (J. B. Nicholas, J. Fan, H. Wu, S. D. Colson, and L. S. Wang), *J. Chem. Phys*. **102**, 8277-8280 (1995).
31. "Photoelectron Spectroscopy of FeO^- and FeO_2^-: Observation of Low-Spin Excited States of FeO and Determination of the Electron Affinity of FeO_2", (J. Fan and L. S. Wang), *J. Chem. Phys*. **102**, 8714-8417 (1995).
32. "Photoelectron Spectroscopy of Size-Selected Transition Metal Clusters: Fe_n^-, n = 3-24", (L. S. Wang, H. S. Cheng, and J. Fan), *J. Chem. Phys*. **102**, 9480-9493 (1995).
33. "Two Isomers of CuO_2: The $Cu(O_2)$ Complex and the Copper Dioxide", (H. Wu, S. R. Desai, and L. S. Wang), *J. Chem. Phys*. **103**, 4363-4366 (1995).
34. "Study of Iron-Carbon Mixed Clusters, FeC_n (n = 2-5): A Possible Linear To Cyclic Transition From FeC_3 to FeC_4", (L. S. Wang), *Surf. Rev. Lett*. **3**, 423-427 (1996).
35. "Iron Clusters and Oxygen-Chemisorbed Iron Clusters", (L. S. Wang, J. Fan, and L. Lou), *Surf. Rev. Lett*. **3**, 695-699 (1996).
36. "Electronic Structure of Small Titanium Clusters: Emergence and Evolution of the 3d Band", (H. Wu, S. R. Desai, and L. S. Wang), *Phys. Rev. Lett*. **76**, 212-215 (1996).
37. "Electronic Structure of Small Copper Oxide Clusters: From Cu_2O to Cu_2O_4", (L. S. Wang, H. Wu, S. R. Desai, and L. Lou), *Phys. Rev.* B **53**, 8028-8031 (1996).
38. "A Photoelectron Spectroscopic Study of Small Silicon Oxide Clusters: SiO_2, Si_2O_3 and Si_2O_4", (L. S. Wang, H. Wu, S. R. Desai, J. Fan, and S. D. Colson), *J. Phys. Chem*. **100**, 8697-8700 (1996).
39. "Observation and Photoelectron Spectroscopic Study of Novel Mono- and Di-iron Oxide Molecules: FeO_y^- (y =

1-4) and $Fe_2O_y^-$ (y = 1-5)", (H. Wu, S. R. Desai, and L. S. Wang), *J. Am. Chem. Soc*. **118**, 5296-5301 (1996). [Additions and Corrections: *J. Am. Chem. Soc*. **118**, 7434 (1996)].

40. "Sequential Oxygen Atom Chemisorption on Surfaces of Small Iron Clusters", (L. S. Wang, H. Wu, and S. R. Desai), *Phys. Rev. Lett*. **76**, 4853-4856 (1996).
41. "Dimer Growth, Structure Transition and Antiferromagnetic Ordering in Small Chromium Clusters", (H. S. Cheng and L. S. Wang), *Phys. Rev. Lett.* **77**, 51-54 (1996).
42. "Evolution of the Electronic Structure of Small Vanadium Clusters From Molecular to Bulk-like", (H. Wu, S. R. Desai, and L. S. Wang), *Phys. Rev. Lett.* **77**, 2436-2439 (1996).
43. "Vibrationally Resolved Photoelectron Spectroscopy of AlO^- and AlO_2^-", (S. R. Desai, H. Wu, and L. S. Wang), *Int. J. Mass Spectrom. Ion Processes* **159**, 75-80 (1996).
44. "Photoelectron Spectroscopy and Electronic Structure of Met-Car Ti_8C_{12}", (L. S. Wang, S. Li, and H. Wu), *J. Phys. Chem*. **100**, 19211-19214 (1996).
45. "A Study of the Structure and Bonding of Small Aluminum Oxide Clusters by Photoelectron Spectroscopy, $Al_xO_y^-$ (x = 1, 2, y = 1-5)", (S. R. Desai, H. Wu, C. Rohfling, and L. S. Wang), *J. Chem. Phys*. **106**, 1309-1317 (1997).
46. "Small Silicon Oxide Clusters: Chains and Rings", (L. S. Wang, S. R. Desai, H. Wu, and J. B. Nicholas), *Z. Phys. D - Atoms, Molecules and Clusters* **40**, 36-39 (1997).
47. "Chemical Bonding Between Cu and Oxygen - Copper Oxides vs O_2 Complexes: A Study of CuO_x (x = 0-6) Species by Anion Photoelectron Spectroscopy", (H. Wu, S. R. Desai, and L. S. Wang), *J. Phys. Chem*. *A* **101**, 2103-2111 (1997).
48. "Photoelectron Spectroscopy of Chromium Clusters: Observation of Even-Odd Alternations and Theoretical Interpretation", (L. S. Wang, H. Wu, and H. Cheng), *Phys. Rev.* B **55,** 12884-12887 (1997).
49. "Growth Pathways of Metallocarbohedrenes: Cage-like or Cubic?", (L. S. Wang and H. Cheng), *Phys. Rev. Lett*. **78**, 2983-2986 (1997).
50. "Si_3O_x (x = 1-6): Models for Oxidation of Silicon Surfaces and Defect Sites in Bulk Oxide Materials", (L. S. Wang, J. B. Nicholas, M. Dupuis, H. Wu, and S. D. Colson), *Phys. Rev. Lett*. **78**, 4450-4453 (1997).
51. "A Study of Nickel Monoxide (NiO), Nickel Dioxide (ONiO), and Ni-O_2 Complex by Anion Photoelectron Spectroscopy", (H. Wu and L. S. Wang), *J. Chem. Phys.* **107**, 16-21 (1997).
52. "Probing the Electronic Structure of Metallocarbohedrenes: M_8C_{12} (M = Ti, V, Cr, Zr, and Nb)", (S. Li, H. Wu, and L. S. Wang), *J. Am. Chem. Soc.* **119**, 7417-7422 (1997).
53. "Vibrationally Resolved Photoelectron Spectra of TiC_x^- (x = 2-5) Clusters", (X. B. Wang, C. F. Ding, and L. S. Wang), *J. Phys. Chem*. (Letter) A **101**, 7699-7701 (1997).
54. "Electronic Structure and Photoelectron Spectroscopy of AlSi Mixed Dimer", (X. B. Wang and L. S. Wang), *J. Chem. Phys*. **107**, 7667-7672 (1997).
55. "Electronic Structure of Titanium Oxide Clusters: TiO_y (y = 1-3) and $(TiO_2)_n$ (n = 1-4)", (H. Wu and L. S. Wang), *J. Chem. Phys*. **107**, 8221-8228 (1997).
56. "Photoelectron Spectroscopy of Transition Metal Clusters", (L. S Wang and H. Wu), *Z. Phys. Chem*. (Munich) **203**, 45-55 (1998).
57. "A Photoelectron Spectroscopic Study of Vanadium Oxide Anions: VO_x^- (x = 1-4)", (H. Wu and L. S. Wang), *J. Chem. Phys*. **108**, 5310-5318 (1998).
58. "New Magic Numbers in $Ti_xC_y^-$ Anion Clusters and Implication for the Growth Mechanisms of Large Carbide Clusters", (L. S. Wang, X. B. Wang, H. Wu, and H. C. Cheng), *J. Am. Chem. Soc.* **120**, 6556-6562 (1998).
59. "Al_3O_x (x = 0-5) Clusters: Sequential Oxidation, Metal-to-Oxide Transformation, and Photo-isomerization" (H. Wu, X. Li, X. B. Wang, C. F. Ding, and L. S. Wang), *J. Chem. Phys*. **109**, 449-458 (1998).
60. "s-p Hybridization and Electron Shell Structures in Aluminum Clusters: A Photoelectron Spectro-scopy Study", (X. Li, H. Wu, X. B. Wang, and L. S. Wang), *Phys. Rev. Lett*. **81**, 1909-1912 (1998).
61. "The Chemical Bonding and Electronic Structure of RhC, RhN, and RhO by Anion Photoelectron Spectroscopy", (X. Li and L. S. Wang), *J. Chem. Phys*. **109**, 5264-5268 (1998).
62. "Photodetachment Spectroscopy of A Doubly Charged Anion: Direct Observation of the Repulsive Coulomb Barrier", (X. B. Wang, C. F. Ding, and L. S. Wang), *Phys. Rev. Lett*. **81**, 3351-3354 (1998).
63. "Probing the Potential Barriers and Intramolecular Electrostatic Interactions in Free Doubly Charged Anions", (L. S. Wang, C. F. Ding, X. B. Wang, and J. B. Nicholas), *Phys. Rev. Lett.* **81**, 2667-2670 (1998).
64. "Photoelectron Spectroscopy and Electronic Structure of ScO_n^- (n = 1-4) and YO_n^- (n = 1-5): Strong Electron Correlation Effects in ScO^- and YO^-", (H. Wu and L. S. Wang), *J. Phys. Chem*. A **102**, 9129-9135 (1998).
65. "Photoelectron Spectroscopy of Doubly Charged Anions: Intramolecular Coulomb Repulsion and Solvent Stabilization" (C. F. Ding, X. B. Wang, and L. S. Wang), *J. Phys*. *Chem*. A **102**, 8633-8636 (1998).
66. "Observation of a Spin-Protected High Energy Isomer of Al_4N^- Cluster", (S. K. Nayak, B. K. Rao, P. Jena, X.

Li, and L. S. Wang) *Chem. Phys. Lett*. **301**, 379-384 (1999).

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68. "First Experimental Photoelectron Spectra of Superhalogens and Their Theoretical Interpretation" (X. B. Wang, C. F. Ding, L. S. Wang, A. I. Boldyrev, and J. Simons), *J. Chem. Phys*. **110**, 4763-4771 (1999).
69. "Photodetachment Photoelectron Spectroscopy of Multiply Charged Anions Using Electrospray Ionization" (L. S. Wang, C. F. Ding, X. B. Wang, and S. E. Barlow), *Rev. Sci. Instrum*. **70**, 1957-1966 (1999).
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71. "A Combined Photoelectron Spectroscopy and Ab Initio Study of the Hypermetallic Al_3C Molecule" (A. I. Boldyrev, J. Simons, X. Li, W. Chen, and L. S. Wang), *J. Chem*. *Phys*. **110**, 8980-8985 (1999).
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73. "Electron Tunneling through the Repulsive Coulomb Barrier in Photodetachment of Multiply Charged Anions" (X. B. Wang, C. F. Ding, and L. S. Wang), *Chem. Phys. Lett.* **307**, 391-396 (1999).
74. "Tetracoordinated Planar Carbon in the Al_4C^- Anion. A Combined Photoelectron Spectroscopy and Ab Initio Study" (X. Li, L. S. Wang, A. I. Boldyrev, and J. Simons), *J. Am. Chem. Soc*. **121**, 6033-6038 (1999).
75. "Observation of Negative Electron-Binding Energy in a Molecule" (X. B. Wang and L. S. Wang), *Nature* **400**, 245-248 (1999). (**Highlighted: *C&E News*, July 19, 1999**)
76. "The Electronic Structure of MoC and WC by Anion Photoelectron Spectroscopy" (X. Li, S. Liu, W. Chen, and L. S. Wang), *J. Chem. Phys*. **111**, 2464-2469 (1999). [Erratum: *J. Chem. Phys*. **129**, 119902 (2008)]
77. "Photodetachment of Free Hexahalogenometallate Doubly Charged Anions in the Gas Phase: $[ML_6]^{2-}$, (M = Re, Os, Ir, Pt; L = Cl and Br)" (X. B. Wang and L. S. Wang), *J. Chem. Phys*. **111**, 4497-4509 (1999).
78. "The Electronic Structure and Chemical Bonding of Hypermetallic Al_5C by Ab Initio Calculations and Anion Photoelectron Spectroscopy" (A. I. Boldyrev, J. Simons, X. Li, and L. S. Wang), *J. Chem. Phys*. **111**, 4993-4998 (1999).
79. "Photoelectron Spectra of Aluminum Cluster Anions: Temperature Effects and Ab Initio Simulations" (J. Akola, M. Manninen, H. Hakkinen, U. Landman, X. Li, and L. S. Wang), *Phys. Rev*. B **60**, R11297-R11300 (1999).
80. "Experimental Search for the Smallest Stable Multiply-Charged Anions in the Gas Phase" (X. B. Wang and L. S. Wang), *Phys. Rev. Lett*. **83**. 3402-3405 (1999).
81. "Electronic Structure and Chemical Bonding Between the First Row Transition Metals and C_2: A Photoelectron Spectroscopy Study of MC_2^- (M = Sc, V, Cr, Mn, Fe, and Co)" (X. Li and L. S. Wang), *J. Chem. Phys*. **111**, 8389-8395 (1999).
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84. "Vibrationally Resolved Photoelectron Spectroscopy of PO_3^- and the Electronic Structure of PO_3" (X. B. Wang and L. S. Wang), *Chem. Phys. Lett*. **313**, 179-183 (1999).
85. "Photodetachment of Gaseous Multiply-Charged Anions –- Copper Phthalocyanine Tetrasulfonate Tetraanion: Tuning Molecular Electronic Energy Levels by Charging and Negative Electron Binding" (X. B. Wang, K. Ferris, and L. S. Wang), *J. Phys. Chem*. A **104**, 25-33 (2000). (**Featured on Cover**)
86. "Photodetachment of Multiply-Charged Anions" (L. S. Wang), *Comments on Modern Phys*. D **2**, 207-221 (2001). (**Invited**)
87. "Photoelectron Spectroscopy and Theoretical Calculations of SO_4^- and HSO_4^-: Confirmation of High Electron Affinities of SO_4 and HSO_4" (X. B. Wang, J. B. Nicholas, and L. S. Wang), *J. Phys. Chem*. A **104**, 504-508 (2000).
88. "Vibrationally Resolved Photoelectron Spectroscopy of the First Row Transition Metal and C_3 Clusters: MC_3^- (M = Sc, V, Cr, Mn, Fe, Co, and Ni)" (L. S. Wang and X. Li), *J. Chem. Phys*. **112**, 3602-3608 (2000).
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514. "Probing the Nature of the Transition-Metal Boron Bonds and Novel Aromaticity in Small Metal-Doped Boron Clusters Using Photoelectron spectroscopy" (T. T. Chen, L. F. Cheung, and L. S. Wang), *Annu. Rev. Phys. Chem*. **73**, 233-253 (2022). https://doi.org/10.1146/annurev-physchem-082820-113041
515. "Probing Copper-Boron Interactions in the $Cu_2B_8^-$ Bimetallic Cluster" (M. Kulichenko, W. J. Chen, H. W. Choi, D. F. Yuan, A. I. Boldyrev, and L. S. Wang), *J. Vac. Sci Technol. A* **40**, 042201 (2022). https://doi.org/10.1116/6.0001833 (**Invited for David A. Shirley special issue**)
516. "Selective Semihydrogenation of Polarized Alkynes by a Gold Hydride Nanocluster" (J. Dong, J. R. Robinson, Z. H. Gao, L. S. Wang), *J. Am. Chem. Soc*. **144**, 12501-12509 (2022). https://doi.org/10.1021/jacs.2c05046
517. "Probing the Electronic Structure and Bond Dissociation of SO_3 and SO_3^- using High-Resolution Cryogenic Photoelectron Imaging" (D. F. Yuan, T. Trabelsi, Y. R. Zhang, J. S. Francisco, and L. S. Wang), *J. Am. Chem. Soc*. **144**, 13740-13747 (2022). https://doi.org/10.1021/jacs.2c04698
518. "The Smallest 4f-Metalla-Aromatic Molecule of Cyclo-PrB_2^- with Pr–B Multiple Bonds" (Z. L. Wang, T. T. Chen, W. J. Chen, W. L. Li, J. Zhao, X. L. Jiang, J. Li, L. S. Wang, and H. S. Hu), *Chem. Sci*. **13**, 10082-10094 (2022). DOI: 10.1039/D2SC02852B
519. "Probing the Strong Nonadiabatic Interactions in the Triazolyl Radical Using Photodetachment Spectroscopy and Resonant Photoelectron Imaging of Cryogenically-Cooled Anions" (Y. R. Zhang, D. F. Yuan, and L. S. Wang), *J. Am. Chem. Soc*. **144**, 16620-16630 (2022). https://doi.org/10.1021/jacs.2c07167
520. "Dipole-Bound State, Photodetachment Spectroscopy, and Resonant Photoelectron Imaging of Cryogenically-Cooled 2-Cyanopyrrolide" (D. F. Yuan, Y. R. Zhang, and L. S. Wang), *J. Phys. Chem. A* **126**, 6416-6428 (2022). https://doi.org/10.1021/acs.jpca.2c04405 (**Paul L. Houston Festschrift**)
521. "Photoelectron Imaging of Cryogenically-Cooled BiO^- and BiO_2^- Anions" (G. S. Kocheril, H. W. Gao, D. F. Yuan, and L. S. Wang), *J. Chem. Phys*. **157**, 171101 (2022). https://doi.org/10.1063/5.0127877
522. "Investigation of the Electronic and Vibrational Structures of the 2-Furanyloxy Radical using Photoelectron Imaging and Photodetachment Spectroscopy via the Dipole-Bound State of the 2-Furanyloxide Anion" (Y. R. Zhang, D. F. Yuan, and L. S. Wang), *J. Phys. Chem. Lett*. **13**, 11481-11488 (2022). https://doi.org/10.1021/acs.jpclett.2c03382

6. Invited Lectures (for the past 10 years)

Professional conferences (past 10 years)

72. 245th American Chemical Society National Meeting, New Orleans, LA, April 7–11, 2013. Symposium on Frontiers in Reaction Dynamics. **Invited Talk:** Size-selected gold clusters: structure evolution and O_2 activation.
73. 2013 DOE Heavy Element Chemistry and Separation Science Principal Investigator's Meeting, Gaithersburg, MD, April 21-24, 2013. **Invited Talk:** Probing the actinide-ligand binding and the electronic structure of gaseous actinide molecules and clusters using anion photoelectron spectroscopy
74. First Symposium of the Theoretical Chemistry Center: The Frontiers of Chemical Bonding Theory. Tsinghua University, Beijing, China; May 16-18, 2013. **Invited Talk:** Novel chemical bonding in planar boron and doped-boron clusters.
75. 2013 International Conference on Chemical Bonding (ICCB). Kauai, HI; July 4-8, 2013. **Invited Talk**: Covalent gold.
76. The Sixth International Symposium on Atomic Cluster Collision (ISACC 2013). Wuhan-Chongqing, China; July 18-23, 2013. **Invited Talk**: Probing the structural and electronic properties of atomic clusters using photoelectron spectroscopy.
77. China-Europe International Workshop on Alloy Nanoparticles. Beijing, China; November 18-20, 2013. **Invited Talk**: Boron and bimetallic boron clusters.
78. International Symposium on Atomic Cluster Catalysis. Tsinghua University, Beijing, China. November 21-22, 2013. **Invited Talk**: Size-selected gold clusters: Structure evolution and O_2 activation.

79. American Physical Society 2014 March Meeting, Denver, CO, March 3-7, 2014. Division of Chemical Physics Focus Session "*Surface Chemistry and Catalysis*". **The Earle K. Plyler Prize Lecture:** Probing the structural evolution and size-dependent reactivity of gold clusters by photoelectron spectroscopy.
80. 247th American Chemical Society National Meeting, Dallas, TX, March 16–20, 2014. Division of Physical Chemistry "*Symposium on Cluster Catalysis*." **Invited Talk:** From gas phase gold clusters to ligand-protected gold nanoparticles. Division of Nuclear Chemistry and Technology *Symposium in Honor of Norman Edelstein: A Distinguished and Diverse Scientific Career in Actinide Chemistry.* **Invited Talk:** Probing the electronic structures of low oxidation state uranium molecules.
81. XI GIRONA SEMINAR on Carbon, Metal, and Carbon-Metal Clusters: From Theory to Applications. Girona, Spain, June 30 – July 3, 2014. **Invited Talk:** From planar boron clusters to borophenes.
82. 2014 International Conference on Chemical Bonding (ICCB). Kauai, HI; July 24-28, 2014. **Invited Talk**: From planar boron clusters to borophene and borospherene.
83. XXIII International Materials Research Conferences (IMRC 2014), Cancun, Mexico, August 17-21, 2014. **Invited Plenary Lecture**: From planar boron clusters to borophene and borospherene.
84. The 30th Symposium on Chemical Physics at the University of Waterloo, Waterloo, Canada; Nov. 7-9, 2014. **Invited Talk**: Electrospray photoelectron spectroscopy: From multiply charged anions to ultracold anions.
85. The 3rd Symposium of the Theoretical Chemistry Center: The Frontiers of Computational Catalysis. Tsinghua University, Beijing, China; May 31 – June 2, 2015. **Invited Talk:** Toward the synthesis of the Au_{20} pyramid: A potentially ideal model system for nano-gold catalysts
86. 3rd International Conference on Correlation Effects in Radiation Fields, Rostock, Germany, September 13-18, 2015. **Invited Talk**: From Planar Boron Clusters to Borophenes and Borospherenes.
87. 4th Symposium on **Boron, Boron Compounds, and Boron Nanomaterials: Structure, Properties, Processing, and Application**. Materials Science & Technology 2015, Columbus, Ohio. October 4-8, 2015. **Invited Talk**: From Planar Boron Clusters to Borophenes and Borospherenes.
88. International Symposium on Clusters And Nanomaterials Richmond, Virginia, USA. October 26-29, 2015. **Invited Talk**: Size-Selected Boron Clusters: From 2D Structures to Borophenes and Borospherenes.
89. The 2015 International Chemical Congress of Pacific Basin Societies (Pacifichem 2015), Dec. 15-21, 2010, Honolulu. **Invited Talk:** Probing the Electronic Structures and Chemical Bonding of Uranium Halides and Oxides Using Anion Photoelectron Spectroscopy.
90. 2016 Gordon Research Conference on Molecular and Ionic Clusters, Ventura, CA; January 17-22, 2016. **Invited Talk:** From planar boron clusters to borophenes and borospherenes.
91. 2016 Gordon Research Conference on Photoionization and Photodetachment, Lucca, Italy; Feb. 7-12, 2016. **Invited Talk:** Electrospray photoelectron spectroscopy: From multiply-charged anions to ultracold anions.
92. Symposium on Size Selected Clusters 2011 (S^3C), Davos, Switzerland; Feb. 28 – March 4, 2016. **Invited Talk:** From planar boron clusters to borophenes and borospherenes.
93. 251st American Chemical Society National Meeting, San Diego, CA, March 13–17, 2016. Division of Colloidal Chemistry Symposium on *"Nanometal: Synthesis, Structure, Property, and Application*." **Invited Talk:** Toward the syntheses of the pyramidal Au_{20} and other atom-precise gold nanoclusters using phosphine ligands.
94. 2016 Symposium on Crystalline Materials, Chinese Chemical Society. Xinxiang, China, April 19-22, 2016. **Invited Talk:** Toward the syntheses of the pyramidal Au_{20} and other atom-precise gold nanoclusters using phosphine ligands.
95. International Symposium on New Molecules and Clusters. Shanghai, China, May 27-30, 2016. **Invited Talk:** From planar boron clusters to borophenes and borospherenes.
96. International Workshop on "Structure Prediction of Nanoclusters from Global Optimization Techniques: Computational Strategies and Connection to Experiments". Pau, France; July 5-8, 2016. **Invited Talk:** Photoelectron spectroscopy of size-selected boron clusters: From planar structures to borophenes and borospherenes.
97. 2016 International Conference on Chemical Bonding (ICCB-4). Lihue (Kauai), HI; July 14-18, 2016. **Invited Talk**: Photoelectron spectroscopy of size-selected boron and doped-boron clusters: From planar structures to borophenes, metallo-borophenes, and borospherenes.
98. International Workshop on Delocalized Electrons in Atomic and Molecular Nanoclusters. Ettore Majorana Foundation and Centre for Scientific Culture, Erice, Sicily, Italy; July 22-28, 2016. **Invited Talk:** Electron delocalization in size-selected boron clusters: From planar structures to borophenes and borospherenes.
99. Telluride Meeting on Advanced Particle Imaging Techniques: 1986-2016 and Beyond. Telluride, CO, Aug. 7-12, 2016. **Invited Talk:** Photoelectron imaging: From multiply-charged anions to ultracold anions.
100. International Symposium on "Controlling the Electronic Structure of Semiconductor Nanoparticles by Doping

and Hybrid Formation". Berlin, Germany; February 22-24, 2017. **Invited Talk:** Probing the electronic structure and chemical bonding of size-selected boron and doped-boron clusters using photoelectron spectroscopy.

101. 2017 International Conference on Chemical Bonding (ICCB-5). Lihue (Kauai), HI; June 22-26, 2017. **Invited Talk**: Probing the electronic structure and chemical bonding of size-selected boron and doped-boron clusters using photoelectron spectroscopy: From borophenes to metalloborophenes.
102. International Conference on Boron Chemistry (ICBC-2017). Xinxiang, Henan Province, China; July 5-8, 2017. **Invited Talk**: Probing the electronic structure and chemical bonding of boron and doped-boron clusters using photoelectron spectroscopy.
103. The 16th International Meeting on Boron Chemistry (IMEBoron XVI). The Chinese University of Hong Kong, July 9-13, 2017. **Invited Talk**: Photoelectron spectroscopy of size-selected boron clusters: From planar structures to borophenes and borospherenes.
104. 254st American Chemical Society National Meeting, Washington, DC, August 20–24, 2017. Division of Physical Chemistry Symposium on *"**Gaseous Ion Chemistry & Surface Reactions: The Chemistry of Cold Ions***." **Invited Talk:** Electrospray photoelectron spectroscopy: From multiply-charged anions to ultra-cold anions.
105. 254st American Chemical Society National Meeting, Washington, DC, August 20–24, 2017. Division of Physical Chemistry "**Award Symposium**". **Invited Talk:** Photoelectron spectroscopy of negative ions: From planar boron clusters to borophenes and borospherenes.
106. International Symposium on Nanosurface/Interface and Cluster Chemistry in Energy Materials. Xiamen, China. December 15-17, 2017. **Invited Talk:** Photoelectron spectroscopy of size-selected boron clusters: From planar structures to borophenes and borospherenes.
107. American Society for Mass Spectrometry Sanibel 2018 Conference on "Computational Modeling in Mass Spectrometry and Ion Mobility: Methods for Ion Structure and Reactivity Determination." St. Petersburg, FL. January 25-28, 2018. **Invited Talk:** Electrospray photoelectron spectroscopy: From multiply-charged anions to ultra-cold anions.
108. 2018 Gordon Research Conference/Seminar on Molecular and Ionic Clusters (GRS) − Deciphering the Structures and Dynamics of Molecular and Ionic Clusters, Lucca, Italy; Feb. 24-25, 2018. **Keynote Talk:** Photoelectron spectroscopy of size-selected boron clusters: From planar structures to borophenes and borospherenes; and **Panelist** on the GRS Career Panel "Career Options for Young and Early Career Scientists".
109. Int. Bunsen Discussion Meeting: Gas Phase Model Systems for Catalysis. Ulm, Germany, June 18-20, 2018. **Invited Talk:** CO oxidation by size-selected Au clusters: From gas phase clusters to ligand-protected clusters with in situ active sites.
110. The 16th Boron Chemistry Meeting in the Americas (BORAM XVI), Boston College, MA, June 26-30, 2018. **Invited Talk:** Recent progress in the investigation of size-selected boron clusters: from borophenes to metalloborophenes.
111. 2018 International Conference on Chemical Bonding (ICCB-6). Lihue (Kauai), HI; July 12-17, 2018. **Invited Talk**: Recent progress in the investigation of size-selected boron clusters: borophenes, metalloborophenes & lanthanides inverse sandwiches.
112. 2nd International Symposium on New Molecules and Clusters. Fudan University, Shanghai, China, August 18-20, 2018. **Invited Talk**: Recent progress in the investigation of size-selected boron clusters: borophenes, metalloborophenes & lanthanides inverse sandwiches.
113. 2019 Gordon Research Conference on Gaseous Ions: Structures, Energetics & Reactions. February 17–22, 2019, Ventura, CA. **Invited Talk:** Dipole-bound excited states of resonant photoelectron imaging of cryogenically-cooled anions.
114. Frontiers in Chemistry and Interdisciplinary Sciences – Nankai Summits on "Spectroscopy in Fight". May 10, 2019, College of Chemistry, Nankai University, Tianjin, China. **Invited Talk**: Recent progresses in the investigation of size-selected boron clusters.
115. Manchester International Symposium on "Highly Excited States, Many-Body and Non-Covalent Interactions", June 19 -21, 2019, Manchester, UK, **Invited Talk:** Non-covalent, highly excited dipole-bound states and resonantly-enhanced photoelectron imaging of cryogenically-cooled anions
116. The Second International Conference on Boron Chemistry (ICBC-II), July 14-17, 2019, Taiyuan, Shanxi. **Plenary Talk:** Investigation of size-selected boron clusters: borophenes, metallo-borophenes & M-B multiple bonds.
117. Telluride Workshop on "Advances in Theory of Electronic Resonances", July 22-26, 2019, Telluride, CO. **Invited Talk:** Resonant photoelectron spectroscopy of cold anions via dipole-bound excited states.

118. Symposium on Size Selected Clusters (S^3C), Davos, Switzerland; Feb. 23 – 28, 2020. **Invited Talk:** Metal-doped boron clusters: from molecular wheels to inverse sandwiches.
119. American Chemical Society National Meeting (virtual), April 5–16, 2021. Division of Physical Chemistry "**Award Symposium**". **E. Bright Wilson Award talk:** Electrospray photoelectron spectroscopy: From multiply-charged anions to cryogenically-cooled anions.
120. Telluride Workshop on "Advances in Theory of Electronic Resonances", July 13-17, 2021, Telluride, CO. **Invited Talk:** Probing dipole-bound states using high-resolution resonant photoelectron imaging of cryogenically-cooled anions.
121. The 2020 International Chemical Congress of Pacific Basin Societies (Pacifichem 2020), Dec. 16-20, 2021 (Virtual). Symposium: New Horizon of Main Group and Transition-Metal Aromatics (#229) **Invited Talk:** Aromaticity in boron and metal-boron clusters.
122. The 2020 International Chemical Congress of Pacific Basin Societies (Pacifichem 2020), Dec. 16-20, 2021 (Virtual). Symposium: Advances in Boron and Boron-Related Nanostructures (#334) **Invited Talk:** Recent advances in boron and metal-boron nanoclusters.
123. The 17th Boron Chemistry Meeting in the Americas (BORAM XVII), Blacksburg, VA, June 20-24, 2022. **Invited Talk:** Clusters of boron and metal borides: planar structures, borophenes, and metal-boron bonding.
124. The 3rd Conference on Cluster Science and Atomic Manufacturing (CSAM-III). Taiyuan, China; August 6-8, 2022. **Invited Plenary Talk:** Nanoclusters of boron: borophenes, borospherenes, and metal borides. (zoom)
125. 2022 International Conference on Chemical Bonding (ICCB-7). Lihue (Kauai), HI; August 12-16, 2022. **Invited Talk**: Nanoclusters of boron and metal borides: From aromaticity to boron-metal multiple bonding.
126. 21th International Symposium on *Boron, Borides and Related Materials* (ISBB2022), Paris, France, September 5-9, 2020. **Invited Keynote Talk:** Clusters of boron and metal borides: Borophenes, borospherenes, and boron-metal bonding.
127. The 2022 Gordon Research Conference on Atomically Precise Nanochemistry, Ventura, CA, October 16-21, 2022. Invited Talk: In pursuit of ligand-protected Au_{20} pyramid: From atom-precise gold nanoclusters with in-situ catalytic sites to gold nanohydrides.

Invited Colloquia (past 10 years)

1/16/13 Department of Chemistry, Wayne State University, Detroit, MI. Probing the unique electronic and atomic structures of nanoclusters using photoelectron spectroscopy.
3/26/13 Department of Chemistry, Johns Hopkins University, Baltimore, MA. Probing the electronic and size-selected clusters and multiply charged anions.
5/6/13 Department of Chemical, biological, and Pharmaceutical Engineering, New Jersey Institute of Technology, Newark, NJ. Nanoclusters of boron and gold.
7/13/13 Department of Chemistry, Fudan University, Shanghai, China. Novel chemical bonding in boron and doped boron clusters.
7/15/13 Department of Physics, Nanjing University, Nanjing, China. Nanoclusters of boron and gold.
7/17/13 Wuhan Institute of Physics and Mathematics, Chinese Academy of Sciences, Wuhan, China. Multiply charged anions and dipole-bound states.
7/29/13 Dalian Institute of Chemical Physics, Chinese Academy of Sciences, Dalian, China. Nanoclusters of gold and boron.
8/30/13 Department of Chemistry, Duquesne University, Pittsburgh, PA. Probing the electronic structure of nanoclusters using photoelectron spectroscopy.
9/5/13 Department of Chemistry, University of New Hampshire, Durham, NH. Nanoclusters of boron and gold.
10/14/13 Division of Chemistry and Materials Science, Oak Ridge National Laboratory, Oak Ridge, TN. Nanoclusters of gold and boron.
1/15/14 Department of Chemistry, University of California, Davis, CA. Boron clusters.
5/28/14 JILA Colloquium, University of Colorado, Boulder, CO. Electrospray photoelectron spectroscopy: From multiply charged anions to ultracold anions.
6/23/14 Institute of Physical Chemistry, Karlsruhe Institute of Technology, Karlsruhe, Germany. From planar boron clusters to borophene and borospherene.
6/27/14 Institute of Physical Chemistry, Karlsruhe Institute of Technology, Karlsruhe, Germany. Electrospray photoelectron spectroscopy: From multiply charged anions to ultracold anions.
7/7/14 Department of Physical Chemistry, University of the Basque Country (EHU-UPV), Leioa, Spain. Electrospray photoelectron spectroscopy: From multiply charged anions to ultracold anions.
9/30/14 Department of Chemistry, University of Wisconsin, Madison, WI. Electrospray photoelectron spectroscopy: From multiply charged anions to ultracold anions.

12/29/14 Department of Physics, Tsinghua University, Beijing, China. Electrospray photoelectron spectroscopy: From multiply charged anions to ultracold anions.

12/31/14 Department of Chemistry, Tsinghua University, Beijing, China. From planar boron clusters to borophene and borospherenes.

1/15/15 Department of Chemistry, University of Texas at Austin, Austin, TX. Electrospray photoelectron spectroscopy: From multiply charged anions to ultracold anions.

3/27/15 Department of Physics, Virginia Commonwealth University, Richmond, VA. From planar boron clusters to borophene and borospherenes.

10/16/15 Department of Chemistry, University of Kentucky, Lexington, KY. The 19th Annual Lyle Ramsay Dawson Lecture: Photoelectron spectroscopy of size-selected boron clusters: From planar structures to borophene and borospherenes.

11/2/15 Department of Chemistry, University of Rochester, Rochester, NY. Photoelectron spectroscopy of size-selected boron clusters: From planar structures to borophene and borospherenes.

2/18/16 Department of Physics, Technical University of Berlin, Berlin. Photoelectron spectroscopy of size-selected boron clusters: From planar structures to borophenes and borospherenes.

2/18/16 Departments of Chemistry and Physics, Technical University of Berlin, Berlin. Electrospray photoelectron spectroscopy: From multiply-charged anions to ultra-cold anions.

2/23/16 Department of Chemistry, Oxford University, Oxford, UK. Photoelectron spectroscopy of multiply-charged anions and size-selected clusters.

2/24/16 Departments of Chemistry and Physics, University of Birmingham, Birmingham, UK. Photoelectron spectroscopy of size-selected boron clusters: From planar structures to borophenes and borospherenes.

4/14/16 Changchun Institute of Applied Chemistry, Chinese Academy of Science, Changchun, Jilin, China. Photoelectron spectroscopy of size-selected boron clusters: From planar structures to borophenes and borospherenes.

4/22/16 School of Chemistry and Chemical Engineering, Henan Normal University, Xinxiang, China. Photoelectron spectroscopy of size-selected boron clusters: From planar structures to borophenes and borospherenes.

4/26/16 College of Chemistry and Chemical Engineering, Shanxi University, Taiyuan, China. Probing the electronic structures and chemical bonding of size-selected nanoclusters using photoelectron spectroscopy.

4/28/16 Institute of Molecular Science, Shanxi University, Taiyuan, China. Photoelectron spectroscopy of size-selected boron clusters: From planar structures to borophenes and borospherenes.

5/10/16 College of Materials Science and Chemistry, Chinese University of Geoscience, Wuhan, China. Photoelectron spectroscopy of size-selected boron clusters: From planar structures to borophenes and borospherenes.

5/11/16 College of Chemistry, Wuhan University, Wuhan, China. Photoelectron spectroscopy of size-selected boron clusters: From planar structures to borophenes and borospherenes.

5/23/16 Shanghai Institute of Applied Physics, Chinese Academy of Science, Shanghai. Probing the actinide-ligand binding and the electronic structure of actinide molecules and clusters using photoelectron spectroscopy.

5/25/16 Department of Chemistry, Tongji University, Shanghai. Photoelectron spectroscopy of multiply-charged anions and size-selected clusters.

6/21/16 Institute of Physical Chemistry, Karlsruhe Institute of Technology, Karlsruhe, Germany. Photoelectron imaging of cold anions: Resonant photoelectron spectroscopy via dipole- and quadrupole-bound excited states.

6/27/16 Wilhelm-Ostwald-Institut für Physikalische und Theoretische Chemie, Universität Leipzig**,** Germany. Photoelectron spectroscopy of size-selected boron clusters: From planar structures to borophenes and borospherenes.

1/16/17 College of Chemistry, Henan Normal University, Xinxiang, China. Metal doped boron clusters: From borophenes to metalloborophenes.

5/4/17 Department of Chemistry, Stony Brook University, Stony Brook, NY. Photoelectron spectroscopy of size-selected boron clusters: From planar structures to borophenes and borospherenes.

5/23/17 Department of Chemistry, University of Wurzburg, Germany. Photoelectron spectroscopy of size-selected boron clusters: From planar structures to borophenes and borospherenes.

5/30/17 Department of Chemistry, University of Kaiserslautern, Germany. Electrospray photoelectron spectroscopy: From multiply-charged anions to ultracold anions.

6/2/17 Institute of Physical Chemistry, Karlsruhe Institute of Technology, Karlsruhe, Germany. Recent progress

in the study of size-selected boron clusters.

7/21/17 Institute of Molecular Science, Shanxi University, Taiyuan, China. Electrospray photoelectron spectroscopy: From multiply-charged anions to ultracold anions.

7/27/17 Institute of Modern Physics, Chinese Academy of Science, Lanzhou, China. Electrospray photoelectron spectroscopy: From multiply-charged anions to ultracold anions.

7/27/17 Department of Chemistry, Lanzhou University, Lanzhou, China. Photoelectron spectroscopy of size-selected boron clusters: From planar structures to borophenes and borospherenes.

8/2/17 Department of Chemistry, Peking University, Beijing, China. Photoelectron spectroscopy of boron clusters: From planar structures to borophenes and borospherenes.

8/3/17 Department of Chemistry, Tsinghua University, Beijing, China. Electrospray photoelectron spectroscopy: From multiply-charged anions to ultracold anions.

10/31/17 Molecular Foundry, Lawrence Berkeley National Laboratory, Berkeley, CA. Photoelectron spectroscopy of boron clusters: From planar structures to borophenes and borospherenes.

11/29/17 Department of Chemistry, University of California at Riverside, Riverside, CA. Photoelectron spectroscopy of size-selected boron clusters: From planar structures to borophenes and borospherenes.

3/26/18 The Seaborg Institute, Los Alamos National Laboratory, Los Alamos, NM. Probing the electronic structure of gaseous actinide molecules and size-selected boron clusters using photoelectron spectroscopy.

5/20/18 Department of Chemistry, Tsinghua University, Beijing. Recent progress in the studies of size-selected boron clusters: borophenes, metalloborophenes & lanthanide inverse-sandwiches.

1/7/19 School of Materials Science and Engineering, Nankai University, Tianjin. Recent progress in the studies of size-selected boron clusters: borophenes, metalloborophenes & lanthanide inverse-sandwiches.

7/1/19 Institute of Chemistry, Chinese Academy of Sciences, Beijing. Recent progress in the studies of size-selected boron clusters: from borophenes to metalloborophenes.

7/10/19 Department of Chemistry, Zhengzhou University, Zhengzhou, Henan. Investigation of size-selected boron clusters: from borophenes to metalloborophenes

7/14/19 Department of Chemistry, Shanxi University, Taiyuan, Shanxi. Recent progress in the investigation of size-selected boron clusters: from borophenes to metalloborophenes.

1/30/20 Department of Chemistry, Brown University, Providence, RI. Probing the electronic structure and chemical bonding of nanoclusters and cold solution anions

2/28/20 Department of Physics, University of Gothenburg, Gothenburg, Sweden. Electrospray photoelectron spectroscopy: from multiply charged anions to ultracold anions.

2/2/21 Department of Chemistry, Yale University, New Heaven, CT. Resonant photoelectron spectroscopy of cryogenically-cooled anions via dipole-bound excited states.

4/27/21 Physics Colloquium, Innsbruck University, Austria. Electrospray photoelectron spectroscopy: From multiply-charged anions to cryogenically-cooled anions.

9/10/21 Department of Chemistry, Brown University, Providence, RI. Electrospray photoelectron spectroscopy: From multiply-charged anions to cryogenically-cooled anions.

5/12/2022 Department of Chemistry, Federico Santa Maria Technical University, Santiago, Chile. Size-selected boron clusters: from planar structures to borophenes to metal-boron multiple bonds.

7. Service

University:

Chair, Department of Chemistry: 2019 – present.
Nomination committee: 2016- 2019

To the profession

Co-chair, International Conference on Chemical Bonding, Lihue HI, August 11-16, 2022

Co-organizer, International Symposium on New Molecules and Clusters, Shanghai, China, August 18-21, 2018

Co-chair, International Symposium on Small Particles and Inorganic Clusters (ISSPIC), International Conference Center, Hangzhou, China, August 12-17, 2018.

Co-chair, International Conference on Chemical Bonding, Lihue HI, July 13-17, 2018

Co-chair, International Conference on Chemical Bonding, Lihue HI, June 22-26, 2017

Co-chair, International Conference on Chemical Bonding, Lihue HI, July 14-18, 2016

Co-organizer, International Symposium on New Molecules and Clusters, Shanghai, China, May 27-30, 2016.

Referee for the 2017 Guggenheim Fellows
International Advisory Committee, *International Symposium of Small Particles and Inorganic Clusters* (ISSPIC), 2004 – present.
International Advisory Committee, *International Symposium on Size Selected Clusters* (S^3C), 2004 – present.
Editorial Advisory Board, *Journal of Physical Chemistry*, 2007 – 2010; 2014 – present.
Editorial Board Member, *Chinese Journal of Chemical Physics*, 2006 – present.
Advisory Editorial Board, *Chemical Physics Letters*, 2013 – present.
Associate Editor, *Journal of Chemical Physics*, 10/1/19 – 12/31/21

8. Teaching

Spring 2010
Chem 2980, Research: Supervised research for four graduate students
Supervised four Postdoctoral Research Associates

Fall 2010
Chem 1140, Physical Chemistry – Quantum Mechanics Enrollment: 32
Chem 2980, Research: Supervised research for four graduate students
Supervised four Postdoctoral Research Associates

Spring 2011
Chem 1150, Physical Chemistry – Thermodynamics and Statistical Mechanics Enrollment: 16
Chem 2980, Research: Supervised research for six graduate students
Supervised four Postdoctoral Research Associates

Fall 2011
Chem 1140, Physical Chemistry – Quantum Mechanics Enrollment: 39
Chem 0970, Undergraduate research: Supervised research for one student
Chem 2980, Research: Supervised research for four graduate students
Supervised four Postdoctoral Research Associates and one visiting scholar

Spring 2012
Chem 1150, Physical Chemistry – Thermodynamics and Statistical Mechanics Enrollment: 17
Chem 0970, Undergraduate research: Supervised research for one student
Chem 2980, Research: Supervised research for 5 graduate students
Supervised four Postdoctoral Research Associates and one visiting scholar

Fall 2012
Chem 1140, Physical Chemistry – Quantum Mechanics Enrollment: 29
Chem 0970, Undergraduate research: Supervised research for one student
Chem 2980, Research: Supervised research for 5 graduate students
Supervised four Postdoctoral Research Associates and one visiting scholar

Spring 2013
Chem 1150, Physical Chemistry – Thermodynamics and Statistical Mechanics Enrollment: 13
Chem 0970, Undergraduate research: Supervised research for one student
Chem 2980, Research: Supervised research for 5 graduate students
Supervised four Postdoctoral Research Associates and one visiting scholar

Fall 2013
Chem 1140, Physical Chemistry – Quantum Mechanics Enrollment: 30
Chem 2980, Research: Supervised research for 5 graduate students
Supervised four Postdoctoral Research Associates and three visiting scholar

Spring 2014
Chem 1150, Physical Chemistry – Thermodynamics and Statistical Mechanics Enrollment: 9

Chem 0970, Undergraduate research: Supervised research for one student
Chem 2980, Research: Supervised research for 7 graduate students
Supervised two Postdoctoral Research Associates and two visiting scholar

Fall 2014
Chem 0330, Equilibrium, Rate, and Structure Enrollment: 125
Chem 0970, Undergraduate research: Supervised research for one student
Chem 2980, Research: Supervised research for 6 graduate students
Supervised one Postdoctoral Research Associate and two visiting scholars

Spring 2015
Chem 1150, Physical Chemistry – Thermodynamics and Statistical Mechanics Enrollment: 14
Chem 0970, Undergraduate research: Supervised research for one student
Chem 2980, Research: Supervised research for 7 graduate students
Supervised one Postdoctoral Research Associates and one visiting scholar

Fall 2015
Chem 2980, Research: Supervised research for 7 graduate students
Sabbatical leave

Spring 2016
Chem 2980, Research: Supervised research for 7 graduate students
Sabbatical leave

Fall 2016
Chem 0330, Equilibrium, Rate, and Structure Enrollment: 126
Chem 2980, Research: Supervised research for 7 graduate students

Spring 2017
Chem 1150, Physical Chemistry – Thermodynamics and Statistical Mechanics Enrollment: 9
Chem 2980, Research: Supervised research for 7 graduate students

Summer 2017
Hosted three international summer students (one from Peking University and two from Tsinghus University)

Fall 2017
Chem 1140, Physical Chemistry – Quantum Mechanics Enrollment: 25
Chem 2980, Research: Supervised research for 7 graduate students
Supervised one visiting international student (Tongji University)

Spring 2018
Chem 1150, Physical Chemistry – Thermodynamics and Statistical Mechanics Enrollment: 10
Chem 2980, Research: Supervised research for 8 graduate students

Summer 2018
Supervised on ULTRA student (Sonny Mo)
One student received PhD (Qian-Fan Zhang, August 2018)

Fall 2018
Chem 1140, Physical Chemistry – Quantum Mechanics Enrollment: 31
Chem 2980, Research: Supervised research for 8 graduate students
Supervised one postdoctoral fellow
Supervised one visiting scholar (Dr. Hui Bai) and two visiting international students
(Mr. Bing Bai and Mr. Gang Li)

Spring 2019
Chem 1150, Physical Chemistry – Thermodynamics and Statistical Mechanics Enrollment: 11

Chem 2980, Research: Supervised research for 9 graduate students
Supervised one postdoctoral fellow
Supervised one visiting scholar (Dr. Hui Bai) and one visiting international student (Mr. Bing Bai)
Supervised one undergraduate researcher

Fall 2019
Chem 2980, Research: Supervised research for 9 graduate students
Supervised one postdoctoral fellow
Supervised one undergraduate researcher

Spring 2020
Chem 2980, Research: Supervised research for 9 graduate students
Supervised one postdoctoral fellow
Supervised one undergraduate researcher

Fall 2020
Chem 2980, Research: Supervised research for 7 graduate students
Supervised one postdoctoral fellow
Supervised one undergraduate researcher

Spring 2021
Chem 2980, Research: Supervised research for 8 graduate students
Supervised one postdoctoral fellow
Supervised one undergraduate researcher

Fall 2021
Chem 2980, Research: Supervised research for 7 graduate students
Supervised one postdoctoral fellow
Supervised two undergraduate researcher

Spring 2022
Chem 2980, Research: Supervised research for 11 graduate students
Chem 0980: Undergraduate Research: Supervised 2 undergraduate researchers
Supervised one postdoctoral fellow

Fall 2022
Chem 2980, Research: Supervised research for 8 graduate students
Supervised one postdoctoral fellow