

## **Jingguang G. Chen (Curriculum Vitae)**

**Current Positions:** Thayer Lindsley Professor of Chemical Engineering,  
Columbia University, New York, NY 10027  
Senior Chemist, Director of Synchrotron Catalysis Consortium,  
Brookhaven National Laboratory, Upton, NY 11973

### **Positions Held:**

2012 – Present: Thayer Lindsley Professor of Chemical Engineering, Columbia University  
2012 – Present: Joint Appointment at Chemistry Division, Brookhaven National Laboratory  
2005 – Present: Director, Synchrotron Catalysis Consortium, Brookhaven National Laboratory  
2019 – 2022: Department Chair of Chemical Engineering, Columbia University  
2008 – 2012: Claire D. LeClaire Professor of Chemical Engineering, University of Delaware  
2009 – 2012: Co-Director, Energy Frontier Research Center on Biomass Conversion  
2008 – 2010: Interim Director, University of Delaware Energy Institute  
2000 – 2007: Director, Center for Catalytic Science and Technology (CCST)  
2005 – 2012: Professor of Chemistry (courtesy appointment), University of Delaware  
2002 – 2012: Professor of Chemical Engineering, University of Delaware  
1998 – 2001: Associate Professor of Materials Science and Engineering and Chemical  
Engineering, University of Delaware  
1994 – 1998: Spokesperson of Exxon U1A Beamline at National Synchrotron Light Source  
1990 – 1998: Staff Scientist, Exxon Corporate Research Laboratory, Annandale, New Jersey

### **Selected Awards and Recognitions:**

Fellow, American Institute of Chemical Engineers (AIChE) (2021)  
Robert H. Wilhelm Award in Chemical Reaction Engineering, AIChE (2020)  
Distinguished Alumni Award, Chemistry Department, University of Pittsburgh (2020)  
R.B. Anderson Award, Canadian Catalysis Division (2019)  
Web of Science Highly Cited Researcher (2019-2021)  
Robert Burwell Lectureship in Catalysis, North American Catalysis Society (2017)  
Eastman Distinguished Lecturer in Catalysis, University of California at Berkeley (2017)  
George Olah Award in Hydrocarbon/Petroleum Chemistry, American Chemical Society (2015)  
Giuseppe Parravano Memorial Award in Catalysis, Michigan Catalysis Society (2015)  
Fellow, American Chemical Society (2013)  
Herman Pines Award in Catalysis, Chicago Catalysis Club (2011)  
Excellence in Undergraduate Advising and Mentoring, University of Delaware (2011)  
Excellence in Catalysis Award, New York Catalysis Society (2008)  
Fellow, American Vacuum Society (2008)  
Excellence in Catalysis Award, Philadelphia Catalysis Club (2004)  
Alexander von Humboldt Postdoctoral Fellow (Germany, 1988 – 1989)  
Leybold-Heraeus Award (Leybold-Heraeus Corporation, 1987)  
Russell and Siguard Varian Fellow (American Vacuum Society, 1986)  
Graduate Student Award (American Vacuum Society Conference, 1986)  
Andrew W. Mellon Predoctoral Fellow (University of Pittsburgh, 1985 – 1987)  
USA-China Chemistry Graduate Program Fellowship (1983)

### **Editorial Boards:**

Associate Editor, *ACS Catalysis* (2016 – present)  
Associate Editor, *Applied Surface Science* (2011 – 2015)  
Associate Editor, *Surface Science Reports* (2004 – 2010)

Editorial Advisory Board, *Journal of Physical Chemistry Letters* (2023 – )  
Editorial Advisory Board, *Carbon Future* (2023 – )  
Editorial Advisory Board, *Acta Physico-Chimica Sinica* (2009 – 2015)  
Editorial Advisory Board, *Chinese Journal of Catalysis* (2007 – 2015)  
Editorial Advisory Board, *Surface Science* (2001 – 2003)  
Editorial Advisory Board, *Langmuir* (1998 – 2000)

### **Selected Service in Catalysis and Energy Communities:**

President, North American Catalysis Society (2017 – Present)  
Director and Co-Founder, Synchrotron Catalysis Consortium for DOE (2005 – Present)  
USA Representative, Board of International Association of Catalysis Societies (2016 – Present)  
Advisory Board: ChemCatBio Center, National Renewable Energy Laboratory (2021 – Present)  
Advisory Board: DOE EFRC for Plastics Innovation at Univ. Delaware (2020 – Present)  
Advisory Board: SUNCAT Center for Interface Science and Catalysis, SLAC (2019 – Present)  
Panel Lead: DOE-BES Virtual Roundtable on Foundational Science for Carbon-Neutral Hydrogen Technologies (2021)  
Member, DOE Basic Energy Sciences Advisory Committee (BESAC) (2017 – 2018)  
Member, Council for DOE/BES Chemical and Biochemical Sciences (2012 – 2016)  
Director-at-Large: North American Catalysis Society (2005 – 2017)  
Co-Chair: DOE Chemical Sciences Workshop on N<sub>2</sub> Activation (2016)  
Co-Chair: DOE/BES Roundtable on Sustainable Ammonia Synthesis (2016)  
Co-Chair: DOE/BES Catalysis PIs Meeting (2015)  
Chair: Catalysis Division of American Chemical Society (2014 – 2015)  
Director-at-Large: Catalysis Division of American Chemical Society (2008 – 2012)  
Executive Committee: Catalysis and Reaction Engineering Division of AIChE (2010 – 2012)  
Executive Committee: Surface Science Division of American Vacuum Society (2008 – 2010)  
Advisory Board: Photon Sciences Division of BNL (2013 – 2018)  
Advisory Board: DOE Center for Functional Nanomaterials (2007 – 2011)  
Advisory Board: DOE Energy Frontier Research Center at LSU (2009 – 2011)  
Catalysis Secretariat: American Chemical Society (2006 – 2007)  
Chair: Philadelphia Catalysis Club (2004)  
Chair: Gordon Research Conference on Catalysis (2002)

### **Education and Training:**

1988 - 1989                    Alexander von Humboldt Postdoctoral Fellow  
   Forschungszentrum-Julich, Germany; Advisor: Harald Ibach  
1983 - 1988                    Andrew W. Mellon Pre-doctoral Fellow  
   University of Pittsburgh, Ph.D. Chemistry; Advisor: John T. Yates,  
1978 - 1982                    B.S. Chemistry  
   Nanjing University, China

### **Highlights of Publications and Patents:**

- 470+ Journal Publications
- 23 United States Patents
- 50,000+ citations; *h-index*=100 (GoogleScholar as of December 2022)
- Web of Science Highly Cited Researcher (2019 – 2022)

### **United States Patents:**

1 “Selective Opening of Five and Six Membered Rings”, S. Hantzer, M.S. Touvelle and

- J.G. Chen, United States Patent, 5,811,624 (1998).
2. "Desulfurization and Aromatic Saturation of Feedstream Containing Condensed Refractory Organosulfur Heterocycles and Aromatics", D.P. Klein, M.S. Touvelle, E.S. Ellis, C.W. Hudson, S. Hantzer, J.G. Chen, D.E.W. Vaughan, J.J. Schorfheide, W.C. Baird, G.B. McVicker, United States Patent, 5,925,239 (1999).
  3. "Desulfurization and Ring Opening of Petroleum Streams", G.B. McVicker, J.J. Schorfheide, W.C. Baird, Jr., M.S. Touvelle, M. Daage, D.P. Klein, E.S. Ellis, D.E.W. Vaughan and J.G. Chen, United States Patent, 5,928,498 (1998).
  4. "Desulfurization Processes for Refractory Organosulfur Heterocycles", W.C. Baird, Jr., G.B. McVicker, J.J. Schorfheide, D.P. Klein, S. Hantzer, M. Daage, M.S. Touvelle, E.S. Ellis, D.E.W. Vaughan and J.G. Chen, United States Patent, 5,935,420 (1999).
  5. "Desulfurization and Ring Opening of Petroleum Streams", G.B. McVicker, J.J. Schorfheide, W.C. Baird, Jr., M.S. Touvelle, M. Daage, D.P. Klein, E.S. Ellis, D.E.W. Vaughan and J.G. Chen, United States Patent, 6,103,106 (2000).
  6. "Desulfurization of Petroleum", G.B. McVicker, J.J. Schorfheide, W.C. Baird, Jr., M.S. Touvelle, M. Daage, D.P. Klein, E.S. Ellis, D.E.W. Vaughan and J.G. Chen, United States Patent, 6,193,877 (2001).
  7. "Desulfurization of Petroleum Streams Containing Condensed Ring Heterocyclic Organosulfur Compounds", D.P. Klein, M.S. Touvelle, E.S. Ellis, J.G. Chen, D.E.W. Vaughan, J.J. Schorfheide, W.C. Baird, G.B. McVicker, United States Patent, 6,221,240 (2001).
  8. "Desulfurization Processes for Refractory Organosulfur Heterocycles", W.C. Baird, Jr., G.B. McVicker, J.J. Schorfheide, D.P. Klein, S. Hantzer, M. Daage, M.S. Touvelle, E.S. Ellis, D.E.W. Vaughan and J.G. Chen, United States Patent, 6,245,221 (2001).
  9. "Ring Opening with Group VIII Metal Catalysts Supported on Modified Substrate", W.C. Baird, Jr., J.G. Chen and G.B. McVicker, United States Patent, 6,586,650 (2003).
  10. "Method and Catalyst for Opening Naphthenic Rings of Naphthenic Ring-Containing Compounds", W.C. Baird, Jr., D.P. Klein, M.S. Touvelle and J.G. Chen, United States Patent, 6,589,416 (2003).
  11. "Ring Opening with Group VIII Metal Catalysts Containing Cracking Moderators", W.C. Baird, Jr., J.G. Chen and G.B. McVicker, United States Patent, 6,623,625 (2003).
  12. "Naphthene Ring Opening over a Ring Opening Catalyst Combination", W.C. Baird, Jr., J.G. Chen and G.B. McVicker, United States Patent, 6,623,626 (2003).
  13. "Regeneration of Hydrogen Sulfide Sorbents", J.G. Chen, L.D. Brown, W.C. Baird, Jr., G.B. McVicker, E.S. Ellis, M.S. Touvelle, D.P. Klein and D.E.W. Vaughan, United States Patent, 6,649,043 (2003).
  14. "Naphthene Ring Opening over an Iridium Ring Opening Catalyst", W.C. Baird, Jr., D.P. Klein, J.G. Chen and G.B. McVicker, United States Patent, 6,683,020 (2003).
  15. "Regeneration of Iron-Based Hydrogen Sulfide Sorbents", J.G. Chen, L.D. Brown, W.C. Baird, Jr., G.B. McVicker, E.S. Ellis, M.S. Touvelle, D.P. Klein and D.E.W. Vaughan, United States Patent, 6,723,230 (2004).
  16. "PVD Supported Mixed Metal Oxide Catalysts", S. Chaturvedi, J.G. Chen, M.B. Clark, Jr. and A.M. Gaffney, United States Patent, 6,984,750 (2006).
  17. "Method of Preparing Ethylene Glycol from Cellulose", T. Zhang, M. Zheng, N. Ji, A. Wang, Y. Shu, X. Wang, and J.G. Chen, United States Patent, 7,960,594 (2011).
  18. "Bimetallic Alkylation Catalysts", A.M. Gaffney, P.J. Angevine, C.Y. Yeh, J.H. Koegler, and J.G. Chen, United States Patent, 8,105,968 (2012).

19. "Method of Producing Ethylene Glycol from Polyhydroxyl Compound", T. Zhang, M. Zheng, A. Wang, N. Ji, Y. J. Pang, Z. Tai, X. Wang, and J.G. Chen, United States Patent, 8,324,433 (2012).
20. "Methods of Using Tungsten Carbide Catalysts in Preparation of Ethylene Glycol", T. Zhang, N. Ji, M. Zheng, A. Wang, Y. Shu, X. Wang, and J.G. Chen, United States Patent, 8,692,032 (2014).
21. "Fuel Cell Catalyst Including Carbon Support Particles with Metal Carbide Layer and Catalytic Material and Fuel Cell Using the Same", B. Merzougui, M. Shao, L.V. Protsailo and J.G. Chen, United States Patent, 9,147,884 (2015).
22. "Fuel Cell Catalyst Including Carbon Support Particles with Metal Carbide Layer", M. Shao, L.V. Protsailo and J.G. Chen, United States Patent, 9,991,524 (2018).
23. "Electrocatalysts for Hydrogen Evolution and Oxidation Reactions", F. Jiao, Q. Lu, G.S. Hutchings and J.G. Chen, United States Patent, 9,994,961 (2018).

### **Publications in Refereed Journals:**

1. J.G. Chen, J.E. Crowell and J.T. Yates, Jr., "Onset of Oxidation of Al(111) at Low Temperatures: A Study by EELS and AES", *Physical Review*, B33 (1986) 1436-1439.
2. J.E. Crowell, J.G. Chen and J.T. Yates, Jr., "Surface Sensitive Spectroscopic Study of the Interaction of Oxygen with Al(111): Low Temperature Chemisorption and Oxidation", *Surface Science*, 165 (1986) 37-64.
3. J.G. Chen, J.E. Crowell and J.T. Yates, Jr., "Assignment of a Surface Vibrational Mode by Chemical Means: Modification of the Lattice Modes of Al<sub>2</sub>O<sub>3</sub> by a Surface Reaction with H<sub>2</sub>O", *Journal of Chemical Physics*, 84 (1986) 5906-5909.
4. J.E. Crowell, J.G. Chen and J.T. Yates, Jr., "The Adsorption and Decomposition of Carboxylic Acids on Al(111)", *Journal of Electron Spectroscopy and Related Phenomena*, 39 (1986) 97-106.
5. J.G. Chen, J.E. Crowell and J.T. Yates, Jr., "An EELS and TPD Study of the Adsorption and Decomposition of Acetic Acids on the Al(111) Surface", *Surface Science*, 172 (1986) 733-753.
6. J.E. Crowell, J.G. Chen and J.T. Yates, Jr., "A Vibrational Study of the Adsorption and Decomposition of Formic Acid and Surface Formate on Al(111)", *Journal of Chemical Physics*, 85 (1986) 3111-3122.
7. J.G. Chen, T.P. Beebe, Jr., J.E. Crowell and J.T. Yates, Jr., "Reaction of Atomically Clean Aluminum and Chemically Modified Aluminum with Alkyl Halides", *Journal of the American Chemical Society*, 109 (1987) 1726-1729.
8. J.G. Chen, J.E. Crowell and J.T. Yates, Jr., "Differentiation of Single vs. Multiple Vibrational Excitation Processes on Surfaces: An EELS Investigation of the Al<sub>2</sub>O<sub>3</sub> Vibrational Modes", *Physical Review (Rapid Communication)* B35 (1987) 5299-5302.
9. J.E. Crowell, J.G. Chen, D.M. Hercules and J.T. Yates, Jr., "The Adsorption and Thermal Decomposition of Water on Clean and Oxygen-Pre-dosed Al(111)", *Journal of Chemical Physics*, 86 (1987) 5804-5815.
10. J.G. Chen, J.E. Crowell and J.T. Yates, Jr., "The Metal-Metal Oxide Interface: A Study of Thermally Activated Diffusion at the Ni/ Al<sub>2</sub>O<sub>3</sub> Interface Using Electron Spectroscopies", *Surface Science*, 185 (1987) 373-393.
11. J.G. Chen, J.E. Crowell and J.T. Yates, Jr., "Ni Cluster Chemistry on Al<sub>2</sub>O<sub>3</sub>: A Vibrational EELS Study Using Chemisorbed CO on a Model Catalyst: Ni/Al<sub>2</sub>O<sub>3</sub>/Al(111)", *Surface Science*, 187 (1987) 243-264.
12. J.E. Crowell, J.G. Chen and J.T. Yates, Jr., "An Electron Spectroscopic Study of the

- Growth and Thermally Activated Diffusion of Ni Thin Films on Al(111) and Al<sub>2</sub>O<sub>3</sub> /Al(111)", *Thin Solid Films*, 153 (1987) 341-347.
13. L. Ng, J.G. Chen, P. Basu and J.T. Yates, Jr., "Electron Stimulated Decomposition of Alkyl and Fluoroalkyl Ethers Adsorbed on Al<sub>2</sub>O<sub>3</sub>", *Langmuir*, 3 (1987) 1161-1167.
  14. J.G. Chen, P. Basu, L. Ng and J.T. Yates, Jr., "A Comparative Study of the Reactivities of H<sub>2</sub>O, CH<sub>3</sub>OH and CH<sub>3</sub>OCH<sub>3</sub> towards Al(111)", *Surface Science*, 194 (1988) 397-418.
  15. J.G. Chen, J.E. Crowell, P. Basu, L. Ng and J.T. Yates, Jr., "Dissociative Chemisorption of CO on the Ni Films Promoted by Al: Detection of a Precursor State to CO Dissociation by EELS", *Journal of Physical Chemistry*, 92 (1988) 2574-2579.
  16. P. Basu, J.G. Chen, L. Ng, M.L. Colaianni and J.T. Yates, Jr., "Fragmentation of Molecular Adsorbates by Electron and Ion Bombardment: Methoxy Chemistry on Al(111)", *Journal of Chemical Physics*, 89 (1988) 2406-2411.
  17. J.G. Chen, P. Basu, T.H. Ballinger and J.T. Yates, Jr., "A Transmission Infrared Spectroscopic Investigation of the Reaction of Dimethyl Ether with Alumina Surfaces", *Langmuir*, 5 (1989) 352-356.
  18. J.G. Chen, W. Erley and H. Ibach, "A FT-RAIRS Investigation of the Nature of the 3-Fold Bridge-CO Species on Ni(111)", *Surface Science*, 223 (1989) L891-896.
  19. J.G. Chen, W. Erley and H. Ibach, "A RAIRS Investigation of the Interaction between the Coadsorbed NO and Oxygen on Ni(111): Observation of a Substantial N-O Bond Strengthening", *Surface Science*, 224 (1989) 215-234.
  20. J.G. Chen, M.L. Colaianni, J.T. Yates, Jr. and G.B. Fisher, "Thermal Behavior of a Rh/Al<sub>2</sub>O<sub>3</sub> Model Catalyst: The Disappearance of Surface Rh upon Heating", *Journal of Physical Chemistry*, 94 (1990) 5059-5062.
  21. J.G. Chen, W. Erley and H. Ibach, "A RAIRS Observation of the Local Interaction between the Coadsorbed NO and CO on Ni(111)", *Surface Science*, 227 (1990) 79-89.
  22. J.G. Chen, W. Erley and H. Ibach, "Significant N-O Bond Strengthening upon the Interaction of NO with Coadsorbed Oxygen on Ni(111)", *Vacuum*, 41 (1990) 74-75.
  23. W. Erley, J.G. Chen and D. Sander, "The Formation of Acetic Anhydride by Decomposition of Acetic Acid on Ni(111)", *Journal of Vacuum Science and Technology*, A8 (1990) 976-978.
  24. J.G. Chen, S. Lehwald, G. Kisters, E. Preuss and H. Ibach, "A Surface Stress Induced (1x1) to (5x1) Reconstruction of an Ir(100) Surface", *Journal of Electron Spectroscopy and Related Phenomena*, 54/55 (1990) 405-413.
  25. M.D. Weisel, J.G. Chen and F.M. Hoffmann, "Characterization of CO/H<sub>2</sub> Reaction Intermediate by FT-IRAS: Potassium Formate on Ru(001)", *Journal of Electron Spectroscopy and Related Phenomena*, 54/55 (1990) 787-794.
  26. J.G. Chen, M.L. Colaianni, W.H. Weinberg and J.T. Yates, Jr., "Direct Vibrational Detection of Surface Reaction Channels Leading to CO Dissociation and to Its Inhibition on Mo(110)", *Chemical Physics Letters*, 177 (1991) 113-117.
  27. S. Lehwald, J.G. Chen, G. Kisters, E. Preuss and H. Ibach, "Surface Phonon Dispersion Investigation of the (1x1) to (5x1) Reconstruction of an Ir(100) Surface", *Physical Review*, B43 (1991) 3920-3927.
  28. G. Kisters, J.G. Chen, S. Lehwald and H. Ibach, "Adsorption of CO on the Unreconstructed and Reconstructed Ir(100) Surfaces", *Surface Science*, 245 (1991) 65-71.
  29. J.G. Chen, M.D. Weisel, J.H. Hardenbergh, F.M. Hoffmann, C.A. Mims and R.B. Hall, "Evidence for the Potassium-Promoted Activation of Methane on a K-Doped NiO/Ni(100) Surface", *Journal of Vacuum Science and Technology*, A9 (1991) 1684-1687.

30. J.G. Chen, M.D. Weisel and R.B. Hall, "A Vibrational Investigation of the Stability, Morphology and Surface Reactivity of NiO on Ni(100)", *Surface Science*, 250 (1991) 159-168.
31. R.B. Hall, J.G. Chen, J.H. Hardenbergh and C.A. Mims, "Reactivity of NiO and K-Doped NiO Thin Films on Ni(100) with Hydrogen and Methane", *Langmuir*, 7 (1991) 2548-2554.
32. M.L. Colaianni, J.G. Chen, W.H. Weinberg and J.T. Yates, Jr., "The Adsorption and Dissociation of CO on Clean and Oxygen-Modified Mo(110) Surfaces", *Journal of the American Chemical Society*, 114 (1992) 3735-3743.
33. J.G. Chen, D.A. Fischer, J.H. Hardenbergh and R.B. Hall, "A Fluorescence-Yield Near-Edge Spectroscopy (FYNES) Investigation of the Reaction Kinetics of NiO/Ni(100) with Hydrogen", *Surface Science*, 279 (1992) 13-22.
34. M.L. Colaianni, J.G. Chen, W.H. Weinberg and J.T. Yates, Jr., "Oxygen on Mo(110): Low-Temperature Adsorption and High Temperature Oxidation", *Surface Science*, 279 (1992) 211-222.
35. J.G. Chen, M.L. Colaianni, W.H. Weinberg and J.T. Yates, Jr., "The Cu/Al<sub>2</sub>O<sub>3</sub>/Al(111) Interface: Initial Film Growth and Thermally-Induced Diffusion of Copper into the Bulk", *Surface Science*, 279 (1992) 223-232.
36. M.D. Weisel, J.G. Chen, F.M. Hoffmann, Y.-K. Sun and W.H. Weinberg, "A FT-IRAS Study of the Formation and Decomposition of Chemisorbed Formate on Clean and Potassium-Modified Ru(001)", *Journal of Chemical Physics*, 97 (1992) 9396-9411.
37. M.L. Colaianni, J.G. Chen and J.T. Yates, Jr., "Facile Carbon Monoxide Dissociation on Copper: Promotion by Aluminum", *Journal of Physical Chemistry*, 97 (1993) 2707-2710.
38. J.G. Chen, M.D. Weisel, Z.-M. Liu and J.M. White, "Effect of Carbon Modification on a Vanadium (110) Surface: Observation of Surface Reactivities characteristics of Platinum-Group Metals", *Journal of the American Chemical Society*, 115 (1993) 8875-8876.
39. J.G. Chen, B.D. DeVries, J.T. Lewandowski, and R.B. Hall, "Direct Differentiation of Surface and Bulk Compositions of Powder Catalysts: Application of Electron-Yield and Fluorescence-Yield NEXAFS to LixNi<sub>1-x</sub>O", *Catalysis Letters*, 23 (1994) 25-35.
40. J.G. Chen, C.M. Kim, B. Fruhberger, B.D. DeVries and M.S. Touvelle, "A NEXAFS Determination of the Oxidation State of Vanadium Carbide on V(110): Observation of Charge Transfer from Vanadium to Carbon", *Surface Science*, 321 (1994) 145-155.
41. C.M. Kim, B.D. DeVries, B. Fruhberger and J.G. Chen, "A HREELS and NEXAFS Characterization of Atomic and Molecular Oxygen Species on a Vanadium (110) Surface", *Surface Science*, 327 (1995) 81-92.
42. J.G. Chen, "Selective Activation of C-H and C=C Bonds on Metal Carbides: A Comparison of Reactions of n-Butane and 1,3-Butadiene on Vanadium Carbide Films on V(110)", *Journal of Catalysis*, 154 (1995) 80-90.
43. J.G. Chen, B.D. DeVries, B. Fruhberger C.M. Kim and Z.-M. Liu, "Spectroscopic Characterization of Thin Vanadium Carbide Films on a Vanadium (110) Surface: Formation, Stability and Reactivities", *Journal of Vacuum Science and Technology*, A13 (1995) 1600-1605.
44. R. Kapoor, S.T. Oyama, B. Fruhberger, B.D. DeVries and J.G. Chen, "Characterization of Early Transition Metal Carbides and Nitrides by NEXAFS", *Catalysis Letters*, 34 (1995) 179-189.
45. B. Fruhberger and J.G. Chen, "Modification of the Surface Reactivity of Mo(110) upon Carbide Formation", *Surface Science*, 342 (1995) 38-46.

46. B. Fruhberger and J.G. Chen, J. Eng, Jr., and B.E. Bent, "Reactivities of Carbon and Nitrogen-Modified Mo(110): A Comparison of Modification Effects by Surface and Interstitial Adatoms", *Journal of Vacuum Science and Technology*, A14 (1996) 1475-1481.
47. J.G. Chen, B. Fruhberger and M.L. Colaianni, "NEXAFS Characterization of Compositions and Reactivities of Transition Metal Oxides", *Journal of Vacuum Science and Technology*, A14 (1996) 1668-1673.
48. J.G. Chen, "Carbide and Nitride Overlayers on Early Transition Metal Surfaces: Preparation, Characterization and Reactivities", *Chemical Reviews*, 96 (1996) 1477-1498.
49. J.G. Chen and B. Fruhberger, "Similarities in the Decomposition and Dehydrogenation of Cyclohexene on (4x4)-C/Mo(110) and Pt(111)", *Surface Science*, 367 (1996) L102-110.
50. B. Fruhberger and J.G. Chen, "Reaction of Ethylene with Clean and Carbide-Modified Mo(110): Converting the Surface Reactivity of Mo to Pt-Group Metals", *Journal of the American Chemical Society*, 118 (1996) 11599-11609.
51. B. Fruhberger, J. Eng, Jr. and J.G. Chen, "Observation of Anomalous Reactivities of Ni/Pt(111) Bimetallic Surfaces", *Catalysis Letters*, 45 (1997) 85-92.
52. C.C. Yu, S. Ramanathan, B. Dhandapani, J.G. Chen and S.T. Oyama, "Bimetallic Nb-Mo Carbide Hydroprocessing Catalysts: Synthesis, Characterization and Activity Studies", *Journal of Physical Chemistry*, B 101 (1997) 512-518.
53. R. Kapoor, S.T. Oyama, B. Fruhberger and J.G. Chen, "NEXAFS Characterization and Reactivity Studies of Bimetallic Vanadium Molybdenum Oxynitride Hydrotreating Catalysts", *Journal of Physical Chemistry*, B 101 (1997) 1543-1547.
54. J. Eng, Jr., B.E. Bent, B. Fruhberger and J.G. Chen, "Studies of the Adsorption Geometry and Decomposition Mechanisms of Benzene on Clean and Carbide-Modified Mo(110) Surfaces Using Vibrational Spectroscopy", *Journal of Physical Chemistry*, B 101 (1997) 4044-4054.
55. M.E. Castro, J.G. Chen, R.B. Hall and C.A. Mims, "Reactions of Hot Methyl Groups with Surface Hydrogen during CH<sub>3</sub>-I Bond Scission on Ni(111)", *Journal of Physical Chemistry*, B 101 (1997) 4060-4070.
56. D.-H. Sun, B.E. Bent and J.G. Chen, "Chemistry of Cyclopentadiene on a Cu(100) Surface: Detection of cyclopentadienyl (C<sub>5</sub>H<sub>5</sub>) species as reaction intermediates", *Journal of Vacuum Science and Technology*, A15 (1997) 1581-1585.
57. J.G. Chen, "NEXAFS Investigations of Transition Metal Oxides, Nitrides, Carbides, Sulfides and Other Interstitial Compounds", *Surface Science Reports*, 30 (1997) 1-152.
58. A.V. Teplyakov, A.B. Gurevich, M.X. Yang, B.E. Bent and J.G. Chen, "NEXAFS and TPD Studies of Molecular Adsorption of Hydrocarbons on Cu(100): Segmental Correlations with the Heats of Adsorption", *Surface Science*, 396 (1998) 340-348.
59. V.S. Lusvardi, M.A. Barteau, J.G. Chen, J. Eng, Jr., B. Fruhberger and A.V. Teplyakov, "A NEXAFS Investigation of the Reduction and Reoxidation of TiO<sub>2</sub>(001)", *Surface Science*, 397 (1998) 237-250.
60. A.V. Teplyakov, B.E. Bent, J. Eng, Jr and J.G. Chen, "Vibrational Mode-Softening of Alkanes on Clean and Modified Cu and Mo Surfaces: Absence of a Simple Correlation with Thermal Desorption Temperature", *Surface Science*, 399 (1998) L342-L350.
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473. H. Guo, Z. Xie, X. Wang, J.G. Chen and P. Liu, “Descriptor-based Identification of Bimetallic-derived Catalysts for Selective Activation of Ethane with CO<sub>2</sub>”, *EES Catalysis*, accepted (2023).
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### **Invited Talks and Department Seminars:**

**Invited Talk**, AIChE Annual Meeting, Phoenix, November 2022

**Department Seminar**, Chemical Engineering, Rutgers University, October 2022

**Department Seminar**, College of Engineering, Brown University, October 2022

**Invited Talk**, American Chemical Society Annual Meeting, Chicago, August 2022

**Keynote Lecture** (virtual), 12<sup>th</sup> International Conference on Environmental Catalysis, Osaka, August 2022

**Keynote Lecture** (virtual), Hong Kong Poly Univ. 85<sup>th</sup> Anniversary Workshop, July 2022

**Invited Talk** (virtual), DOE Hydrogen Program 2022 Annual Merit Review, June 2022

**Plenary Lecture** (virtual), Canadian Symposium on Catalysis, Vancouver, May 2022

**Department Seminar**, Chemical Engineering, Virginia Tech, April 2022

**Invited Talk**, American Chemical Society Annual Meeting, San Diego, March 2022

**Department Seminar**, Chemical Engineering, Univ. Houston, March 2022

**Plenary Lecture** (virtual), DOE/BES Roundtable on Foundational Science for CO<sub>2</sub> Removal Technologies, March 2022

**Industry Seminar** (virtual), LyondellBasell, Houston Technology Center, February 2022

**Kurt Wohl Memorial Lecture**, Chemical Engineering, Univ. Delaware, November 2021

**Invited Talk** (virtual), CACS Symposium, AIChE Annual Meeting, Boston, November 2021

**Invited Talk** (virtual), Summit on Decarbonization of the AG Sector, ORNL, September 2021

**Invited Talk** (virtual), American Chemical Society Annual Meeting, Atlanta, August 2021

**Invited Talk** (virtual), National Renewable Energy Laboratory, July 2021

**Department Seminar** (virtual), Chemistry, Queen’s Univ., Canada, May 2021

**Department Seminar** (virtual), Chemical Engineering, Univ. Notre Dame, April 2021

**Department Seminar** (virtual), Chemical Engineering, Texas Tech. Univ. March 2021

**Plenary Session Talk** (virtual), US-UK Joint Symposium on Operando Catalysis, March 2021

**Department Seminar** (virtual), Materials Sci. & Engineering, Nanyang Tech. Univ. March 2021  
**Department Seminar** (virtual), Mechanical Engineering, Univ. Texas, February 2021  
**Department Seminar** (virtual), Chemistry, Univ. Virginia, February 2021  
**Department Seminar** (virtual), École Polytechnique Fédérale de Lausanne, November 2020  
**Invited Talk** (virtual), Pacific Northwest National Laboratory, November 2020  
**Department Seminar** (virtual), Chemical Engineering, Louisiana State Univ. October 2020  
**Department Seminar** (virtual), Chemical Engineering, Oklahoma State Univ. October 2020  
**Department Seminar** (virtual), Chemical Engineering, Univ. Michigan, September 2020  
**Colloquium**, Center for Functional Nanomaterials, BNL, March 2020  
**Distinguished Seminar**, Chemical Engineering, Northeastern University, February 2020  
**Henry Bent Distinguished Lecture**, Chemical Engineering, University of Missouri, Oct. 2019  
**Plenary Session Talk**, DOE Catalysis Science Program Annual PI Meeting, July 2019  
**Department Seminar**, Materials Science & Engineering, Jilin University, May 2019  
**Department Seminar**, Chemical Engineering, Beijing Univ. Chemical Technology, May 2019  
**Invited Talk**, DOE Workshop on Earth Abundant Catalysts, Rockville, MD, April 2019  
**Plenary Lecture**, Great Plains Catalysis Society Annual Meeting, April 2019  
**Invited Talk**, ExxonMobil Symposium at American Chemical Society Meeting, April 2019  
**Department Seminar**, Chemical Engineering, University of Cincinnati, March 2019  
**Burwell Lecture**, Michigan Catalysis Society, November 2018  
**Invited Talk**, Canadian Chemical Engineering Annual Meeting, Toronto, October 2018  
**Invited Talk**, AIChE Annual Meeting, Pittsburgh, October 2018  
**Department Seminar**, Materials Science & Engineering, Cornell University, October 2018  
**Burwell Lecture**, Southeastern Catalysis Society Annual Symposium, Atlanta, September 2018  
**Keynote Lecture**, 7<sup>th</sup> EuCheMS Chemistry Congress, Liverpool, August 2018  
**Department Seminar**, Chemical Engineering, ECUST, July 2018  
**DongWu Lectureship**, Energy Institute, Suzhou University, July 2018  
**Catalysis Forum Lectureship**, Department of Chemistry, Peking University, July 2018  
**Burwell Lecture**, Pittsburgh-Cleveland Catalysis Society Annual Meeting, June 2018  
**Keynote Lecture**, Rocky Mountain Catalysis Society Symposium, June 2018  
**Plenary Lecture**, Canadian Symposium on Catalysis, Saskatoon, May 2018  
**Department Seminar**, Chemical Engineering, Zhejiang University, May 2018  
**Invited Talk**, Chinese Chemical Society Annual Meeting, Hangzhou, May 2018  
**Department Seminar**, College of Chemistry and Engineering, Nanjing University, May 2018  
**Department Seminar**, Chemical Engineering, Tianjin University, May 2018  
**Department Seminar**, College of Materials Science, Nankai University, Tianjin, May 2018  
**Burwell Lecture**, Southwest Catalysis Club Annual Symposium, Houston, April 2018  
**Department Seminar**, Chemical Engineering, University of Oklahoma, March 2018  
**Department Seminar**, Department of NanoEngineering, UC San Diego, January 2018  
**Keynote Lecture**, New England Catalysis Society Annual Meeting, December 2017  
**Burwell Lecture**, Metropolitan New York Catalysis Society, November 2017  
**Department Seminar**, Chemical Engineering, Purdue University, November 2017  
**Burwell Lecture**, Chicago Catalysis Club, November 2017  
**Eastman Lectureship**, Chemical Engineering, UC Berkeley, October 2017  
**Burwell Lecture**, Philadelphia Catalysis Club, October 2017  
**Department Seminar**, Chemical Engineering, University of Buffalo, October 2017  
**Department Seminar**, Chemical Engineering, Washington State University, September 2017  
**Burwell Lecture**, Pacific Coast Catalysis Society Annual Meeting, Davis, CA, September 2017  
**Keynote Lecture**, 17<sup>th</sup> Congress of Asian Pacific Confederation of Chemical Engineering, Hong Kong, August 2017

**Department Seminar**, Chemical Engineering, Hong Kong Univ. Science & Tech, August 2017  
**Department Seminar**, Chemical Engineering, South China Univ. Technology August 2017  
**Keynote Lecture**, 91<sup>st</sup> ACS Colloid & Surface Science Symposium, New York, July 2017  
**Department Seminar**, Chemistry, Wuhan University, June 2017  
**Zhang Dayu Award Lectureship**, Dalian Institute of Chemical Physics, Dalian, June 2017  
**Plenary Lecture**, 2<sup>nd</sup> International Conference on Applied Surface Science, Dalian, June 2017  
**Keynote Lecture**, 25<sup>th</sup> North American Catalysis Meeting (NAM), Denver, June 2017  
**Invited Talk**, Electrochemical Society Annual Meeting, New Orleans, May 2017  
**Department Seminar**, Chemical Engineering, North Carolina State University, March 2017  
**Department Seminar**, Chemical Engineering, Tianjin University, January 2017  
**Invited Talk**, American Vacuum Society (John Yates Symposium), Nashville, November 2016  
**Department Seminar**, Energy Sciences Institute, Yale University, November 2016  
**Invited Talk**, American Chemical Society Annual Meeting, Philadelphia, August 2016  
**Keynote Lecture**, Post-ICC Conference on Nano and Interfacial Catalysis, Dalian, July 2016  
**Invited Talk**, 16<sup>th</sup> International Congress of Catalysis Conference, Beijing, July 2016  
**Plenary Lecture**, Conference on Plasma Applications for Catalysis, Tianjin, June 2016  
**TsingFen Lecture**, Chemistry Department, Tsinghua University, June 2016  
**Department Seminar**, Chemical Science and Engineering, Tongji University, June 2016  
**Department Seminar**, Chemical Engineering, University of Tennessee, April 2016  
**Invited Talk**, American Chemical Society Annual Meeting, San Diego, March 2016  
**Department Seminar**, Materials Sci. & Engineering, Stony Brook University, February 2016  
**Invited Talk**, Catalysis Club of Philadelphia, January 2016  
**Department Seminar**, Chemical Engineering, Zhejiang University, January 2016  
**Invited Talk**, AIChE Annual Meeting, Salt Lake City, November 2015  
**Department Seminar**, Chemical Engineering, Lehigh University, November 2015  
**Keynote Lecture**, Sino-USA Annual Chemical Engineering Meeting, Shanghai, October 2015  
**Chemical Engineering Forum Lecture**, Tsinghua University, October 2015  
**Invited Talk**, American Chemical Society Annual Meeting, Boston, August 2015  
**Industry Seminar**, SABIC Technology Center, June 2015  
**Parravano Memorial Award Lecture**, Michigan Catalysis Society Annual Meeting, May 2015  
**Invited Talk**, Southwest Catalysis Club Annual Meeting, April 2015  
**Department Seminar**, Chemical Engineering, University of Houston, April 2015  
**Department Seminar**, Chemical Engineering, University of California, Riverside, April 2015  
**Nano@Wayne Seminar**, Wayne State University, April 2015  
**George Olah Award Lecture**, American Chemical Society Meeting, Denver, March 2015  
**Department Seminar**, Chemical Engineering, Villanova University, March 2015  
**Distinguished Speaker Seminar**, University of Alabama at Huntsville, March 2015  
**Invited Tutorial Talk**, AIChE Annual Meeting, Atlanta, November, 2014  
**Department Seminar**, Chemical Engineering, University of South Florida, October 2014  
**Keynote Lecture**, American Chemical Society Annual Meeting, San Francisco, August 2014  
**Department Seminar**, Dalian Institute of Chemical Physics, July 2014  
**Department Seminar**, Chemistry Department, Nanjing University, June 2014  
**Department Seminar**, Mechanical Engineering, Shanghai Jiaotong University, June 2014  
**Department Seminar**, Chemistry Department, Columbia University, May 2014  
**Industry Seminar**, BASF Company, New Jersey, May 2014  
**Department Seminar**, Materials Science and Engineering, Tsinghua University, April 2014  
**Department Seminar**, Chemical Engineering, Princeton University, April 2014  
**Eastman Catalysis Lectureship**, University of South Carolina, April 2014  
**Department Seminar**, Chemical Engineering, University of Pittsburgh, April 2014

**Industry Seminar**, ExxonMobil Research and Engineering, New Jersey, April 2014  
**Department Seminar**, Chemical Engineering, Ohio State University, March 2014  
**Invited Talk**, American Chemical Society Annual Meeting, Dallas, March 2014  
**Invited Talk**, Annual Meeting of Material Research Society (MRS), Boston, December 2013  
**Department Seminar**, Chemical Engineering, City College of New York, October 2013  
**Department Seminar**, Chemical Engineering, Rutgers University, October 2013  
**Invited Talk**, New York Catalysis Club, October 2013  
**Department Seminar**, Chemical Engineering, Johns Hopkins University, September 2013  
**Physical Chemistry Forum Lecture**, Peking University, July 2013  
**Industry Seminar**, ExxonMobil Strategic Research Laboratory, March, 2013  
**Keynote Lecture**, Laboratory for Surface Modification Symposium, Rutgers Univ. March, 2013  
**Department Seminar**, Chemistry, Tufts University, February, 2013  
**Invited Talk**, AIChE Annual Meeting, Pittsburgh, October, 2012  
**Department Seminar**, Chemical Engineering, Tsinghua University, October 2012  
**Department Seminar**, Chemical Engineering, Xi'an Jiaotong University, October 2012  
**Invited Lecture**, Chinese National Science Foundation Planning Meeting, October 2012  
**Keynote Lecture**, American Chemical Society Annual Meeting, Philadelphia, August 2012  
**Invited Lecture**, Gordon Research Conference on Catalysis, New Hampshire, June 2012  
**Department Seminar**, Chemical Engineering, Univ. Texas at Austin, April 2012  
**Industry Seminar**, Celanese Ltd., April 2012  
**Department Seminar**, Chemical Engineering, Univ. Kansas, October 2011  
**Invited Talk**, DOE/BES Contractors' Meeting, October 2011  
**Invited Talk**, National Academies Chemical Sciences Roundtable, September 2011  
**Plenary Lecture**, Annual Meeting of the Chicago Catalysis Club, May 2011  
**Invited Lecture**, American Chemical Society Annual Meeting, Anaheim, March 2011  
**Invited Lecture**, New York Catalysis Club, March 2011  
**Plenary Lecture**, Chemical Heritage Foundation, Philadelphia, September 2010  
**Invited Talk**, American Chemical Society Annual Meeting, Boston, August 2010  
**Invited Lecture**, Philadelphia Catalysis Club, May 2010  
**Industry Seminar**, ExxonMobil Chemicals, May 2010  
**Department Seminar**, Chemical Engineering, Univ. Virginia, April 2010  
**Frontier Seminar** in Catalysis, Pacific Northwest National Laboratory, March 2010  
**Department Seminar**, Chemical Engineering, Columbia Univ. February 2010  
**Invited Lecture**, Workshop on Design of Catalytic Materials, Univ. Notre Dame, January 2010  
**Invited Lecture**, Chicago Catalysis Club, November 2009  
**Department Seminar**, Argonne National Laboratory, November 2009  
**Industry Seminar**, British Petroleum, November 2009  
**Department Seminar**, Chemical Engineering, Tsinghua University, September 2009  
**Invited Talk**, American Chemical Society Annual Meeting, Washington, DC, August 2009  
**Keynote Lecture**, New England Catalysis Club Annual Meeting, April 2009  
**Invited Lecture**, Michigan Catalysis Club, April 2009  
**Invited Talk**, American Chemical Society Annual Meeting, Salt Lake City, March 2009  
**Department Seminar**, New Jersey Institute of Technology, February 2009  
**Department Seminar**, Univ. Wisconsin at Madison, January 2009  
**Industry Seminar**, Air Liquide, November 2008  
**Department Seminar**, Department of Chemical Engineering, Purdue Univ. September 2008  
**Industry Seminar**, W.R. Grace, August 2008  
**Invited Lecture**, Gordon Research Conference on Fuel Cells, July 2008  
**Industry Seminar**, BASF, March 2008

**Department Seminar**, Department of Chemistry, Lehigh Univ. December 2007  
**Invited**, Basic Research Needs for Energy, AIChE Meeting, Salt Lake City, November 2007  
**Department Seminar**, Chemical Engineering, Pennsylvania State Univ. October 2007  
**Industry Seminar**, Eastman Chemicals, September 2007  
**Keynote Lecture**, North American Catalysis Meeting, Houston, June 2007  
**Department Seminar**, Dalian Institute of Chemical Physics, China, May 2007  
**Distinguished Lecture** in Catalysis, Pacific Northwest National Laboratory, March 2007  
**Department seminar**, Department of Chemistry, Univ. Ottawa, January 2007  
**Keynote Lecture**, ExxonMobil Research Symposium, October 2006  
**Keynote Lecture**, American Chemical Society Annual Meeting, San Francisco, September 2006  
**Industry Seminar**, ABB Lummus, June 2006  
**Invited Lecture**, National Synchrotron Light Source Annual Meeting, May 2006  
**Industry Seminar**, Headwaters Nanotechnology Inc. April 2006  
**Keynote Lecture**, Annual Meeting of New York Catalysis Club, March 2006  
**Department Seminar**, Department of Chemical Engineering, Ohio State Univ. December 2005  
**Distinguished Lecture** in Nanocatalysis, Chemical Engineering, Tufts Univ. November 2005  
**Department Seminar**, Chemical Engineering, Univ. Pennsylvania, October 2005  
**Department Seminar**, Chemical Engineering, City College of New York, September 2005  
**Industry Seminar**, ExxonMobile Research and Engineering, June 2005  
**Invited Talk**, American Chemical Society, San Diego, March 2005  
**Industry Seminar**, W.L. Gore Associates, November 2004  
**Invited Lecture**, Center of Surface Science, Rutgers University, October 2004  
**Keynote Lecture**, American Vacuum Society Annual Meeting, Anaheim, October 2004  
**Department Seminar**, Chemistry Department, Brookhaven National Laboratory, August 2004  
**Invited Talk**, American Chemical Society Annual Meeting, Philadelphia, August 2004  
**Industry Seminar**, BOC Company, July 2004  
**Invited Lecture**, Gordon Research Conference on Catalysis, New Hampshire, June 2004  
**Hua-Ying Distinguished Lecture**, Nanjing Univ. May 2004  
**Department Seminar**, Chemical Engineering, Virginia Tech, March 2004  
**Industry Seminar**, DuPont Experimental Station, October 2003  
**Invited Talk**, American Chemical Society Annual Meeting, New York, September 2003  
**Plenary Lecture**, 2<sup>nd</sup> International Conference on Elementary Processes in Molecules, Puerto Rico, May 2003  
**Department Seminar**, Chemical Engineering, North Carolina State Univ. March 2003  
**Department Seminar**, Department of Chemistry, Texas A&M Univ. November 2002  
**Department Seminar**, Chemical Engineering, Yale Univ. October 2002  
**Department Seminar**, Department of Chemistry, Peking Univ. October 2002  
**Invited Talk**, American Chemical Society Annual Meeting, Boston, August 2002  
**Industry Seminar**, ExxonMobil Research and Engineering, July 2002  
**Invited Talk**, American Chemical Society Annual Meeting, Orlando, April 2002  
**Department Seminar**, Department of Chemistry, BrynMawr College, February, 2002  
**Department Seminar**, Chemical Engineering, Carnegie Mellon Univ. December 2001  
**Invited Lecture**, Annual Synchrotron User Meeting, Brookhaven National Lab, May 2001  
**Department Seminar**, Department of Chemistry, Temple University, April 2001  
**Department Seminar**, Oak Ridge National Laboratory, June 2001  
**Invited Lecture**, DOE "Catalysis Futures Workshop", Berkeley, March, 2001  
**Industry Seminar**, Johnson Matthey Company, March 2001  
**Invited Lecture**, Pacifichem Meeting, Honolulu, December 2000  
**Invited Lecture**, Pittsburgh Catalysis Club Annual Meeting, December 2000

**Keynote Lecture**, American Vacuum Society Conference, Boston, October 2000  
**Industry Seminar**, Rohm and Haas Company, October 2000  
**Invited Lecture**, Philadelphia Catalysis Club, September 2000  
**Industry Seminar**, Lyondell Company, September 2000  
**Invited Lecture**, Surface Science Center, University of Pittsburgh, August 2000  
**Department Seminar**, Department of Materials Science, Drexel University, January 2000  
**Invited Talk**, North American Catalysis Meeting, Boston, May 1999  
**Department Seminar**, Department of Chemistry, University of Illinois at Chicago, May 1998  
**Invited Talk**, American Chemical Society Annual Meeting, Dallas, April 1998  
**Keynote Lecture**, North American Meeting of the Catalysis Society, Chicago, May 1997  
**Invited Talk**, American Chemical Society Annual Meeting, San Francisco, April 1997  
**Invited Lecture**, Gordon Research Conference on Reactions at Surfaces, February 1997  
**Invited Lecture**, Gordon Research Conference on Catalysis, New London, NH, June 1996  
**Invited Talk**, Pacificchem Meeting, Honolulu, December 1995