Curriculum Vitae

Name: Douglas J. Buttrey

University Address:

Center for Catalytic Science and Technology
Department of Chemical and Biomolecular Engineering
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University of Delaware
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Education:

- Bachelors – 1976 Wayne State University, Biological Sciences
- Masters – 1978 Purdue University, Chemistry (Core Area: Biochemistry)
- Doctorate – 1984 Purdue University, Chemistry (Core Area: Physical Chemistry) – Mentor: Professor Emeritus Jurgen M. Honig
- Postdoctoral Fellow – 1984-85 University of Cambridge, Physical Chemistry – Mentor: Professor Sir John Meurig Thomas, FRS

Professional Experience:

University of Delaware

- Sept 2023 – date University of Delaware, Professor Emeritus, Department of Chemical and Biomolecular Engineering
- 2005 – 2023 University of Delaware, Professor of Chemical and Biomolecular Engineering and Affiliated Associate Professor of Materials Science and Engineering
- 1993–2005 University of Delaware, Associate Professor of Chemical Engineering and Affiliated Associate Professor of Materials Science and Engineering
- 1987–93 University of Delaware, Assistant Professor of Chemical Engineering (also Materials Science Program faculty member)

Other

- 2008 - 2013, 2015 - 16, 2018, 2020, and 2022 Recurring Visiting Professor (~1 month/year), African University of Science and Technology, Abuja, Nigeria https://aust.edu.ng/
- November 2011 Visiting Professor, Université Lille 1, Sciences et Technologies - Nord de France, Cité Scientifique, France
- December 2009 Visiting Professor, COPPE-Federal University of Rio de Janeiro, RJ, Brazil
- February 2009 Visiting Professor, Adam Mickiewicz University, Poznań, Poland
- January 2009 Visiting Professor, Fritz-Haber Institute of the Max Planck Society, Berlin, Germany
- January – April 2008 Visiting Professor, Catalysis Research Center, Hokkaido University, Sapporo, Japan (sabbatical leave from U. Del.)
- September – November 2007 Visiting Professor, NanoCenter, University of South Carolina, Columbia SC (sabbatical leave from U. Del.)
- 1997–98 Visiting Scientist, Physics Department, Brookhaven National Laboratory, Upton, NY (sabbatical leave from U. Del.)
- 1/1986 – 6/1987 Purdue University, Visiting Assistant Professor (3-way joint appointment in the Department of Chemistry, the Department of Physics and Astronomy, and the School of Materials Engineering)
- 1980–84 Purdue University, Graduate Student and Teaching Assistant in Physical Chemistry

Honors and Awards:

- 2018 Special Guest of Honor for the Commencement at the Adama University of Science and Technology, Adama, Ethiopia, 7 July.
- 2017 Special Guest of Honor for the 7th Commencement at the African University of Science and Technology, Abuja, Nigeria, 9 December.
- 2017 Invited Plenary Speaker for the international research symposium “Ensuring Sustainable Development through Research and Technology” 9 June in Adama, Ethiopia.
- 2017 Invited Keynote Speaker for AZeotropy-2017 Conference and Workshop at the Indian Institute of Technology – Bombay, 4 March, Mumbai, India
- 2015 Invited Speaker for 7th Irsee Symposium on Selective Oxidation, Irsee, Germany 4-7 June.
- 2015 Keynote Speaker for the Total Corporate Catalysis Meeting, Mercure Center Louise, Brussels, Belgium, 27-28 January.
- 2014 Plenary Speaker for the 3rd International Symposium on Advanced Electron Microscopy for Catalysis (EMCat14), Seeon Monastery, Bavaria, Germany 3-6 September.
- 2013 Keynote Speaker for the 7th World Congress on Oxidation Catalysis, St. Louis, MO

- 2012 Chemistry Outstanding Alumni Award – Purdue University https://www.chem.purdue.edu/alumni/outstanding.php
- 1988 DuPont Young Faculty Award
- 1984–85 Sohio Research Fellow
- 1983 David Ross Fellow - Purdue Research Foundation
- Member, Phi Lambda Upsilon, National Chemical Honor Society
- Member, Sigma Pi Sigma, National Physics Honor Society

Professional Memberships:

- American Institute of Chemical Engineers
- American Chemical Society

Service:

- Facilitator for the Ife Institute for Advanced Studies - Summer Institute, July 21 – August 2, 2024, Obafemi Awolowo University, Ile-Ife, Nigeria (OAU-Ife).
- Visiting scholar, East Kazakhstan Technical University (EKTU), Oskemen, Republic of Kazakhstan, 27 June – 3 July, 2022.
- Co-organizer of the Irsee IX Symposium on Selective Oxidation Catalysis, Schwäbisches Bildungszentrum in Irsee, Germany, 16–19 June 2022.
- African University of Science and Technology (AUST), Abuja, Nigeria, External Linkages Committee (2022–date)
- UD College of Engineering E-Calc Oversight Committee (2021–22): Engineering Computer-Aided Active Learning Classrooms
- American Association of University Professors (AAUP) Department of Chemical and Biomolecular Engineering Representative (2021–23)
- Member, University of Delaware Council on Community Engagement and Public Service; Subcommittee on Racial Justice, Equity, and Inclusion, May 2020–23.
- Co-organizer of the 2020 African School of Catalysis, University of Rwanda, Kigali, Rwanda, 20 - 24 January 2020. https://ur.ac.rw/?2020-African-School-of-Catalysis-757
- Guest Editor for the Irsee VIII Special Issue of *Topics in Catalysis* 2019-2020.
- Guest Editor for the Robert K. Grasselli Memorial Issue of *Catalysis Today* 2019-2020.
- Chair, UD College of Engineering Elections Committee 2019–22.
- Co-organizer of the Irsee VIII Symposium on Selective Oxidation Catalysis in honor of Professor Robert K. Grasselli, Schwäbisches Bildungszentrum in Irsee, Germany, 23–26 May 2019
- Graduate Community Engagement Certificate Faculty Review Board (2019–2021)
- General Education Committee of the Faculty Senate, University of Delaware (2018–21)
- Honors Faculty Review Board Member, University of Delaware (2018–21).
- Member – Delaware Africa Coalition (2018–present)

- Co-organizer of the American Chemical Society Memorial Symposium "New Vistas in Heterogeneous Catalysis: Symposium in Honor of Robert Grasselli" 22 August 2018, ACS 256th National Meeting, Boston, MA.
- Co-organizer of the Grasselli Memorial Symposium in honor of Robert K. Grasselli, 24 August 2018, Science History Museum, Philadelphia, PA; sponsored by the Center for Catalytic Science and Technology, University of Delaware.
- University of Delaware / State of Delaware Delegation to Nigeria and the Republic of Benin, June 23–July 1, 2018.
- University of Delaware Faculty Senator representing the College of Engineering 2017–21 (two terms).
- College of Engineering Elections Committee (2017–21)
- Promotion and Tenure Evaluator for Khalifa University of Science and Technology, Abu Dhabi, UAE, (2017)
- Faculty Senator for the African University of Science and Technology – Abuja, Nigeria (2016–present).
- UD World Scholars Program Advisory Committee 2016
- Search Committee Member for Director, University of Delaware Institute for Global Studies (2016)
- Co-organizer (with Prof. Ajay Prasad) First UD/Africa Energy Conference April 25–26, 2016 http://www.udel.edu/udaily/2016/may/africa-energy-conference050616.html ; http://www.udel.edu/udaily/2016/mar/ud-africa-energy-conference-032316.html
- Panel moderator for the 40-Year Commemoration of the Soweto Uprising held at the Transcorp Hilton in Abuja, Nigeria 19 July 2016, an event jointly organized by the High Commission of South Africa in cooperation with the Nelson Mandela Institution.
- Juror for the American Chemical Society National Awards Program 2015–24.
- Guest Editor for the Irsee VII Special Issue of *Topics in Catalysis* 2015–16.
- Promotion and Tenure Evaluator for King Abdulaziz City for Science and Technology (KACST), Riyadh, Saudi Arabia 2015.
- UD College of Engineering Awards Selection Committee 2014–22.
- University of Delaware Provost's Strategic Planning Working Group, 2014–15.
- University of Delaware Provost's General Education Task Force – Core Committee, 2014–15.
- University of Delaware Delegation to South Africa, February 14–23, 2014.
- University of Delaware Community Engagement Commission 2014–18.
- Faculty Advisor for the Tanzania Water Project, a registered student organization, 2014–15.
- Interviewer in Baghdad Forum for Iraqi and International Universities and HCED (Higher Committee for Education Development) Third Baghdad Educational Fair, Baghdad International Zone, Iraq, September 28–30, 2013 http://www.hcediraq.org/HCED_english_website/aboutus.html
- Scientific Committee Member for the 7th World Congress on Oxidation Catalysis, St. Louis, MO held June 8–12, 2013.
- Delaware State Delegation to South Africa, February 15–23, 2013.

- University of Delaware Institute for Global Studies Advisory Board Member, 2012-20 http://www.udel.edu/global/
- Member of the UD Search Committee for Director of the Student Success Collaborative (SSC) with responsibility for increasing undergraduate retention and graduation rates, particularly for students from underrepresented and underserved populations.
- University Distinguish Scholars Selection Committee 2011–20.
- Prepared the Chemical Engineering ABET Self-Study Report document for submission in June 2011.
- Engineers Without Borders Faculty Mentor – 2011 Guatemala Project (past)
- Chemical Engineering Curriculum Committee 2010–18, Chair 2010–17.
- UD Associate Chairperson for Undergraduate Studies in Chemical and Biomolecular Engineering 2010–17.
- College of Engineering Instrumentation Committee 2009–13.
- Advisory Committee for Interdisciplinary Science and Engineering Building (ISEB) – Advising on shielding issues for advanced instrumentation 2009–12.
- Advisory Panel for 6th World Congress on Oxidation Catalysis (July 2009, Lille, France).
- American Association of University Professors (AAUP) Steering Committee 2009–14.
- College of Engineering Educational Activities & Accreditation Committee – 2008–15, 2021; Presider 2011–15.
- University Laser Safety Committee 2008–22
- Chemical Engineering Undergraduate Laboratory Committee 2007–17.
- International Organization of Crystal Growers (IOCG) Council liaison with the International Union of Pure and Applied Physics (IUPAP) 2002–08.
- College of Engineering Electron Microscopy Oversight Committee 1999–18; past Chair.
- Academic Program Reviewer for UD Department of Physics and Astronomy (past).
- University Faculty Senate Breadth Requirement Subcommittee (past).
- University Middle States Accreditation Committee – Working Group on a Diverse and Stimulating Undergraduate Experience (past).
- University Committee on Undergraduate Records and Certifications (past).
- First Year Experience (FYE) Advisory Committee (past).
- AAUP Executive Council (past).
- University Radiation Safety Committee (past).
- Advisory Board for the Center for Teaching Effectiveness (past).
- Faculty Senate Undergraduate Studies Committee (past member and Chair).
- Faculty Senate General Education Committee (past).
- Faculty Senate Subcommittee for Revision of the University Multicultural Requirement (past).
- Jefferson Lecture Committee (selection of university-wide lecturers on issues connecting science and society) (past).

Courses Taught at the University of Delaware

- UNIV 101 First Year Experience for Undeclared Students
- CHEG 231 Chemical Engineering Thermodynamics I (Regular and Honors Sections)
- MSEG 302 Materials Science for Engineers (with associated laboratory)
- CHEG 304 Random Variability in Chemical Processes
- CHEG 325 Chemical Engineering Thermodynamics II
- CHEG 332 Chemical Engineering Kinetics
- CHEG 345 Chemical Engineering Laboratory I
- CHEG 404 Probability and Statistics for Engineering Problem Solving
- CHEG 445 Chemical Engineering Laboratory II
- CHEG 667 Synthesis, Structure, and Bonding
- CHEG 626/867 Structure of Materials
- CHEG/MSEG 821 Introduction to Scattering and Diffraction
- CHEG/MSEG 823 Transmission Electron Microscopy in Materials Science

Courses Taught at other Universities

- Engineering Thermodynamics I, African University of Science and Technology, Abuja, Nigeria 2008–10; 2012–13, 2015–16, 2018, 2020, 2022 (3 wks / 45 hrs).
- Thermodynamics of Materials, African University of Science and Technology, Abuja, Nigeria. 2011 & 2016 (3 wks / 45 hrs).
- Introduction to Transmission Electron Microscopy, Université Lille 1, Sciences et Technologies- Nord de France, Cité Scientifique, France 2011 (1 wk / 10 hrs).
- Introduction to Transmission Electron Microscopy, Federal University of Rio de Janeiro, Brazil 2010 (1 wk / 15 hrs).
- Introduction to Transmission Electron Microscopy, Adam Mickiewicz University, Poznań, Poland, 2009 (1 wk / 15 hrs).
- Applications of Analytical Electron Microscopy in Solid State Chemistry, National Science Foundation Workshop on Solid State Chemistry, State University of New York (SUNY) - Binghamton, NY, June Program 1993–95.
- Applications of Analytical Electron Microscopy in Solid State Chemistry, National Science Foundation Workshop on Solid State Chemistry, Northwestern University, Evanston, IL., June Program 1988–92.
- CHEM 376 Physical Chemistry Laboratory (with weekly lectures), Purdue University, West Lafayette, IN, Spring and Fall 1986, Spring 1987.

Outreach for K-12

- Commissioning of a new secondary school block of 3 classrooms in Illushi Village, Edo State, Nigeria, 10 July 2018.

- Keynote presentation entitled “Preparing Students for STEM Careers through Active Learning and Critical Thinking,” Oyomesi Festival of Learning, Oyo State Nigeria, 4 July 2018. This was an event involving approximately 1,000 teachers, administrators, and students from K-12 education in Ibadan, Oyo State, Nigeria and was subsequently commended by UNESCO global headquarters, Paris, resulting in Ibadan being recognized with the “Learning City Award” in 2019: http://uil.unesco.org/lifelong-learning/learning-cities/learning-cities-award-winners-revealed
- Recognition in the *Nigerian Tribune* on October 1, 2018 (Nigerian Independence Day) as an outstanding education mentor for Nigeria.
- Consultant to the Thomas B. Fordham Institute (2012–13) for evaluation of the 2nd draft and the final document for the Next Generation Science Standards (NGSS) for K-12 education in the US. http://edexcellencemedia.net/publications/2013/20130613-NGSS-Final-Review/20130612-NGSS-Final-Review.pdf
- Informal Advisor to Achieve (2012). http://www.achieve.org/
- Presentation entitled “Can We See Atoms?” offered intermittently to groups of high school students from 2003–08, and 2013.
- Workshop for High School Chemistry Teachers on Solid State Chemistry, 1999.

Journal Publications [Citation numbers from Google Scholar in brackets]:

1. [6] M. Pai, D. Buttrey, G. M. Joshi, and J. M. Honig, "Electrical and Magnetic Properties of α-HgS (Cinnabar)," *Phys. Rev. B* **24**, 1087-88 (1981). https://journals.aps.org/prb/abstract/10.1103/PhysRevB.24.1087

2. [125] C. N. R. Rao, D. J. Buttrey, N. Otsuka, P. Ganguly, H. R. Harrison, C. J. Sandberg, J. M. Honig, "Crystal Structure and Semiconductor-Metal Transition of the Quasi-Two-Dimensional Transition Metal Oxide, La_2NiO_4," *J. Solid State Chem.* **51**, 266-269 (1984). https://www.sciencedirect.com/science/article/pii/0022459684903426

3. [69] D. J. Buttrey, H. R. Harrison, J. M. Honig, and R. R. Schartman, "Crystal Growth and Characterization of La_2NiO_4 (Ln = La, Pr, Nd) by Skull Melting," *J. Solid State Chem.* **54**, 407-413 (1984). https://www.sciencedirect.com/science/article/pii/0022459684901725

4. [285] R. Aragón, D. J. Buttrey, J. P. Shepherd, and J. M. Honig, "Influence of Nonstoichiometry on the Verwey Transition," *Phys. Rev. B* **31**, 430-436 (1985). https://journals.aps.org/prb/abstract/10.1103/PhysRevB.31.430

5. [58] R. Aragón, J. P. Shepherd, J. W. Koenitzer, D. J. Buttrey, R. J. Rasmussen, "Influence of Nonstoichiometry on the Verwey Transition in

$Fe_{3(1-\delta)}O_4$," *J. Appl. Phys.* **57**(1), 3221 (1985). https://aip.scitation.org/doi/10.1063/1.335156

6. [101] D. J. Buttrey, J. M. Honig, and C. N. R. Rao, "Magnetic Properties of Quasi-Two-Dimensional La_2NiO_4," *J. Solid State Chem.* **64**, 287-295 (1986). https://www.sciencedirect.com/science/article/pii/0022459686900733

7. [99] D. J. Buttrey, D. A. Jefferson, and J. M. Thomas, "The Structural Relationships between the Bismuth Molybdate Phases with Special Reference to their Catalytic Activity," *Phil. Mag. A* **53**(6), 897-906 (1986). https://www.tandfonline.com/doi/abs/10.1080/01418618608245299

8. [50] D. J. Buttrey, D. A. Jefferson, and J. M. Thomas, "Characterization of a New Bismuth Molybdate Phase - $Bi_{38}Mo_7O_{78}$," *Mat. Res. Bull.* **21**, 739-744 (1986). https://www.sciencedirect.com/science/article/pii/0025540886901546

9. [203] G. Aeppli and D. J. Buttrey, "Magnetic Correlations in $La_2NiO_{4+\delta}$," *Phys. Rev. Lett.* **61**(2), 203-206 (1988). https://journals.aps.org/prl/abstract/10.1103/PhysRevLett.61.203

10. [101] D. J. Buttrey, P. Ganguly, J. M. Honig, C. N. R. Rao, R. R. Schartman, G. N.Subbanna, "Oxygen Excess in Layered Lanthanide Nickelates," *J. Solid State Chem.* **74**, 233-238 (1988). https://www.sciencedirect.com/science/article/pii/0022459688903507

11. [29] D. J. Buttrey and J. M. Honig, "Influence of Nonstoichiometry on the Magnetic Properties of Pr_2NiO_4 and Nd_2NiO_4," *J. Solid State Chem.* **72**, 38-41 (1988). https://www.sciencedirect.com/science/article/pii/0022459688900060

12. [10] G. Aeppli, D. R. Harshman, D. Buttrey, E. Ansaldo, G. P. Espinosa, A. S. Cooper, J. P. Remeika, T. Freltoft, T. M. Riseman, D. R. Noakes, B. Ellman, T. F. Rosenbaum, D. L. Williams, "Magnetic Correlations in $La_2NiO_{4+\delta}$ and $La_{2-x}Sr_xCuO_4$," *Physica C* **153-155**, 1111-1114 (1988). https://www.sciencedirect.com/science/article/pii/0921453488902110

13. [0] D. J. Buttrey, "Superconductivity – A Renewed Challenge," *Transactions of the Delaware Academy of Science* **17**, 11-15 (1988).

14. [95] D. J. Buttrey, J. D. Sullivan, and A. L. Rheingold, "Phase Equilibria in the Y_2O_3-BaO-NiO System--Identification of the New One-Dimensional Phase Y_2BaNiO_5," *J. Solid State Chem.* **88**, 291-302 (1990). https://www.sciencedirect.com/science/article/pii/002245969090226N

15. [46] G. Burns, F. H. Dacol, D. E. Rice, D. J. Buttrey and M. K. Crawford, "Low-Temperature Structural Phase Transition in $La_2NiO_{4+\delta}$," *Phys. Rev. B.*

42, 10777-10780 (1990).
https://journals.aps.org/prb/abstract/10.1103/PhysRevB.42.10777

16. [39] D. J. Buttrey, J. D. Sullivan, G. Shirane, and K. Yamada, "Influence of Oxygen Nonstoichiometry on Structure and Magnetism in $Pr_2NiO_{4+\delta}$," *Phys. Rev. B* **42**, 3944-3951 (1990).
https://journals.aps.org/prb/abstract/10.1103/PhysRevB.42.3944

17. [23] D. E. Rice, M. K. Crawford, D. J. Buttrey, and W. E. Farneth, "Infrared Study of the Low-Temperature-Orthorhombic-Low-Temperature-Tetragonal Structural Phase Transition in La_2NiO_4," *Phys. Rev. B* **42**, 8787-8790 (1990).
https://journals.aps.org/prb/abstract/10.1103/PhysRevB.42.8787

18. [10] P. Wang, M. A. Wittenauer, D. J. Buttrey, Q. W. Choi, P. Metcalf, Z. Kąkol, and J. M. Honig, "Single Crystal Growth and Characterization of Zinc Ferrites, $(Fe_3O_4)_{1-x}(Fe_2ZnO_4)_x$," *J. Cryst. Growth* **104**, 285-290 (1990).
https://www.sciencedirect.com/science/article/pii/0022024890901288

19. [68] J. D. Sullivan, D. J. Buttrey, D. E. Cox, and J. Hriljac, "A Conventional and High-Resolution Synchrotron X-ray Diffraction Study of Phase Separations in $Pr_2NiO_{4+\delta}$," *J. Solid State Chem.* **94**, 337-351 (1991).
https://www.sciencedirect.com/science/article/pii/0022459691902002

20. [55] D. J. Buttrey, T. Freltoft, G. Aeppli, D. Vaknin and G. Shirane, "Magnetic Correlations and Their Excess Oxygen Dependence in $La_2NiO_{4+\delta}$," *Phys. Rev. B.* **44**(10), 5046-5056 (1991).
https://journals.aps.org/prb/abstract/10.1103/PhysRevB.44.5046

21. [157] D. E. Rice and D. J. Buttrey, "An X-ray Diffraction Study of the Oxygen Content Phase Diagram of $La_2NiO_{4+\delta}$," *J. Solid State Chem.* **105**, 197-210 (1993).
https://www.sciencedirect.com/science/article/pii/S0022459683712089

22. [75] J. M. Tranquada, D. J. Buttrey, D. E. Rice, "Phase Separation, Charge Density Waves, and Magnetism in $La_2NiO_{4+\delta}$ with δ =0.105," *Phys. Rev. Lett.* **70**(4), 445-448 (1993).
https://journals.aps.org/prl/abstract/10.1103/PhysRevLett.70.445

23. [540] J. M. Tranquada, D. J. Buttrey, V. Sachan, and J. E. Lorenzo, "Simultaneous Ordering of Holes and Spins in $La_2NiO_{4.125}$," *Phys. Rev. Lett.* **73**(7), 1003-1006 (1994).
https://journals.aps.org/prl/abstract/10.1103/PhysRevLett.73.1003

24. [190] J. M. Tranquada, Y. Kong, J. E. Lorenzo, D. J. Buttrey, D. E. Rice and V. Sachan, "Oxygen Intercalation, Stage Ordering, and Phase Separation in

$La_2NiO_{4+\delta}$ with $0.05 < \delta < 0.11$," *Phys. Rev. B* **50**, 6340-6351 (1994). https://journals.aps.org/prb/abstract/10.1103/PhysRevB.50.6340

25. [97] D. J. Buttrey, T. Vogt, U. Wildgrüber, and W.R. Robinson, "Structural Refinement of the High Temperature Form of Bi_2MoO_6," *J. Solid State Chem.* **111**, 118-127 (1994). https://www.sciencedirect.com/science/article/pii/S0022459684712060

26. [69] E. D. Isaacs, G. Aeppli, P. Zschack, S-W. Cheong, H. Williams, and D. J. Buttrey, "Diffuse X-ray Scattering from $La_{2-x}Sr_xNiO_4$ and $La_{2-y}Sr_yCuO_4$," *Phys. Rev. Lett.* **72**(21), 3421-3424 (1994). https://journals.aps.org/prl/abstract/10.1103/PhysRevLett.72.3421

27. [57] V. Sachan, D. J. Buttrey, J. M. Tranquada, and G. Shirane, "A Neutron Scattering Study of Magnetism in Nd_2BaNiO_5," *Phys. Rev. B* **49**(14), 9658-9662 (1994). https://journals.aps.org/prb/abstract/10.1103/PhysRevB.49.9658

28. [255] J. M. Tranquada, J. E. Lorenzo, D. J. Buttrey, V. Sachan, "Cooperative Ordering of Holes and Spins in $La_2NiO_{4.125}$", *Phys. Rev. B* **52**(5), 3581-3595 (1995). https://journals.aps.org/prb/abstract/10.1103/PhysRevB.52.3581

29. [239] V. Sachan, D. J. Buttrey, J. M. Tranquada, J. E. Lorenzo, G. Shirane, "Charge and Spin Ordering in $La_{2-x}Sr_xNiO_{4.00}$ with x = 0.135 and 0.20," *Phys. Rev. B* **51**(18), 12742-12746 (1995). https://journals.aps.org/prb/abstract/10.1103/PhysRevB.51.12742

30. [77] T. Vogt and D. J. Buttrey, "Low-Temperature Structural Behavior of Sr_2RuO_4," *Phys. Rev. B (Rapid Communications)* **52**(14), R9843-9846 (1995). https://journals.aps.org/prb/abstract/10.1103/PhysRevB.52.R9843

31. [31] J. E. Lorenzo, J. M. Tranquada, D. J. Buttrey, V. Sachan, "Neutron Diffraction Studies on the Time Dependence of the Oxygen Ordering in $La_2NiO_{4.105}$," *Phys. Rev. B* **51**, 3176-3180 (1995). https://journals.aps.org/prb/abstract/10.1103/PhysRevB.51.3176

32. [13] P. Kuiper, D. E. Rice, D. J. Buttrey, H.-J. Lin, and C. T. Chen, "Isotropic O 1s Prepeak as Evidence for Polarons in $La_2NiO_{4+\delta}$," *Physica B* **208-209**, 271-272 (1995) https://www.sciencedirect.com/science/article/pii/0921452694010305

33. [5] J. M. Tranquada, D. J. Buttrey, J. E. Lorenzo, and V. Sachan, "Ordering of Holes and Spins in $La_2NiO_{4.125}$ and $La_{1.8}Sr_{0.2}NiO_4$," *Physica B* **213**, 69-71 (1995). https://www.sciencedirect.com/science/article/pii/092145269500064G

34. [4] D. J. Buttrey, "Phase Separations and Phase Transitions in $La_2NiO_{4+\delta}$" in

35. [1] D. J. Buttrey, R. R. Schartman, and J. M. Honig, "Congruent Growth of Single Crystal La_2NiO_4 and other Layered Nickelates by Radio Frequency Skull Melting", *Inorganic Syntheses* **30**, 133-142 (1995). https://onlinelibrary.wiley.com/doi/10.1002/9780470132616.ch28

36. [227] J. M. Tranquada, D. J. Buttrey, and V. Sachan, "Incommensurate Stripe Order in $La_{2-x}Sr_xNiO_4$ with $x = 0.225$," *Phys. Rev. B* **54**, 12318-12323 (1996). https://journals.aps.org/prb/abstract/10.1103/PhysRevB.54.12318

37. [64] A. Zheludev, J. M. Tranquada, T. Vogt, and D. J. Buttrey, "Magnetic Excitations and Soft Mode Transition in Quasi-1-Dimensional Mixed-Spin Antiferromagnet Pr_2BaNiO_5," *Phys. Rev. B* **54**, 6437-6447 (1996). https://journals.aps.org/prb/abstract/10.1103/PhysRevB.54.6437

38. [57] A. Zheludev, J. M. Tranquada, T. Vogt, and D. J. Buttrey, "Magnetic Gap Excitations in a 1-Dimensional Mixed-Spin Antiferromagnet, Nd_2BaNiO_5," *Phys. Rev. B* **54**, 7210-7215 (1996). https://journals.aps.org/prb/abstract/10.1103/PhysRevB.54.7210

39. [42] A. Zheludev, J. P. Hill, and D. J. Buttrey, "X-ray Magnetic Scattering Study of 3D Magnetic Order in the Quasi-1D Antiferromagnet Nd_2BaNiO_5," *Phys. Rev. B* **54**, 7216-7221 (1996). https://journals.aps.org/prb/abstract/10.1103/PhysRevB.54.7216

40. [35] D. J. Buttrey and T. Vogt, "Temperature Dependent Structural Behavior of Sr_2RhO_4," *J. Solid State Chem.-Letters to the Editor* **123**, 186-189 (1996). https://www.sciencedirect.com/science/article/pii/S002245969690167X

41. [25] S. Bhavaraju, J. F. DiCarlo, D. P. Scarfe, A. J. Jacobson, and D. J. Buttrey, "Electrochemical Oxygen Intercalation in $La_2NiO_{4+\delta}$ Crystals," *Solid State Ionics* **86-88** Part II, 825-831 (1996). https://www.sciencedirect.com/science/article/pii/0167273896001919

42. [23] A. Zheludev, J. M. Tranquada, T. Vogt, and D. J. Buttrey, "Magnetic Excitations and Soft Mode Transition in Pr_2BaNiO_5," *Europhys. Lett.* **35**(5), 385-390 (1996). http://iopscience.iop.org/article/10.1209/epl/i1996-00124-7/meta

43. [77] J. M. Tranquada, P. Wochner, and D. J. Buttrey, "Spin Dynamics in an Ordered Stripe Phase," *Phys. Rev. Lett.* **79**, 2133-2136 (1997). https://journals.aps.org/prl/abstract/10.1103/PhysRevLett.79.2133

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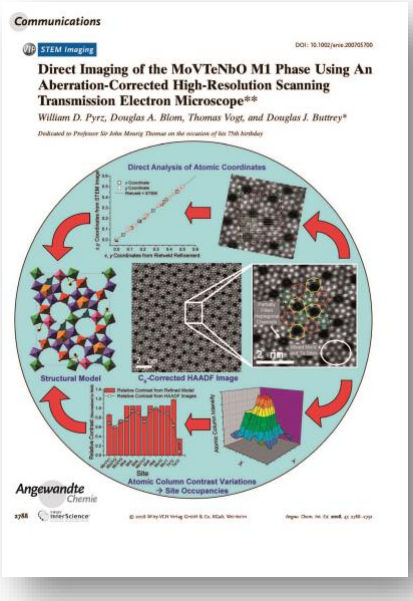

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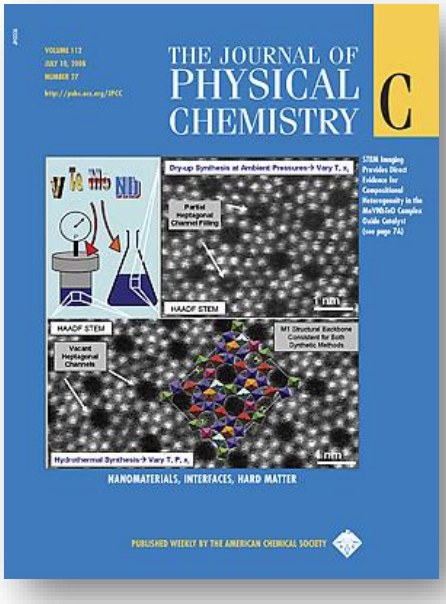

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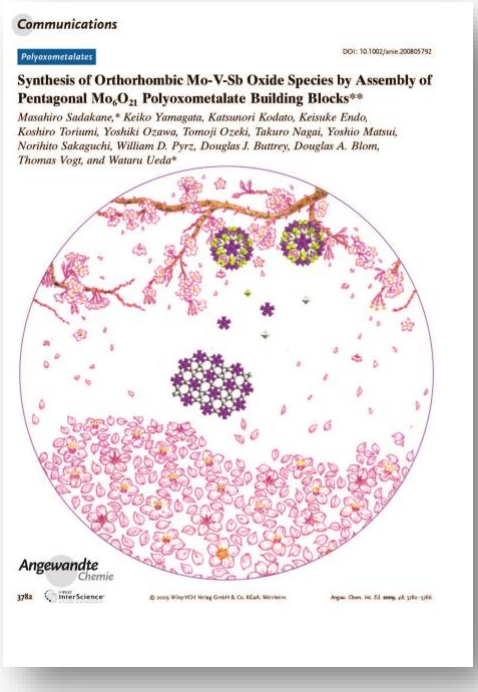
Communications

Polyoxometalates

DOI: 10.1002/anie.200805792

Synthesis of Orthorhombic Mo-V-Sb Oxide Species by Assembly of Pentagonal Mo_6O_{21} Polyoxometalate Building Blocks**

Masahiro Sadakane, Keiko Yamagata, Katsunori Kodato, Keisuke Endo, Koshiro Toriumi, Yoshiki Ozawa, Tomoji Ozeki, Takuro Nagai, Yoshio Matsui, Norihito Sakaguchi, William D. Pyrz, Douglas J. Buttrey, Douglas A. Blom, Thomas Vogt, and Wataru Ueda**

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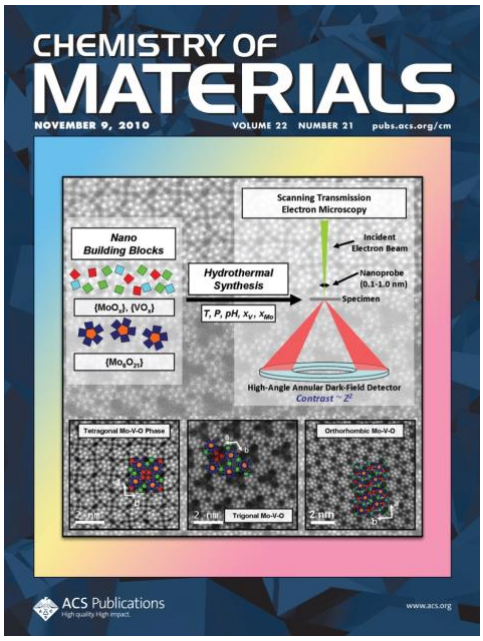

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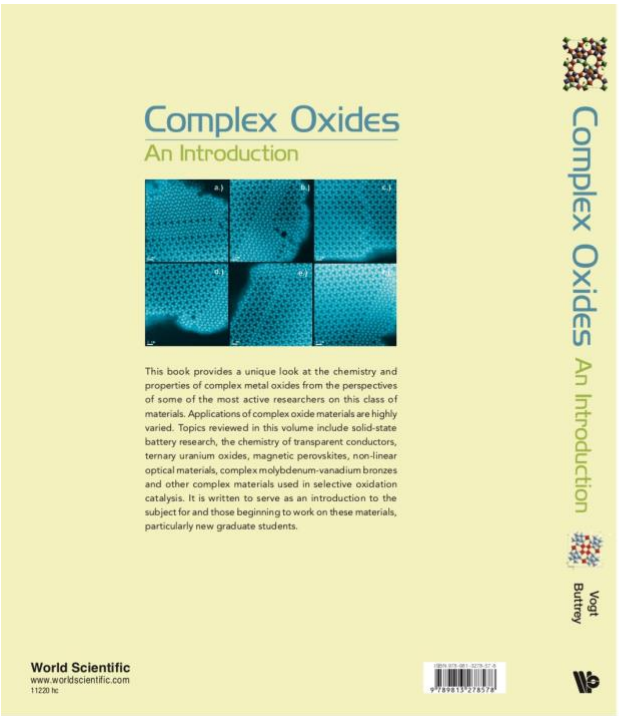

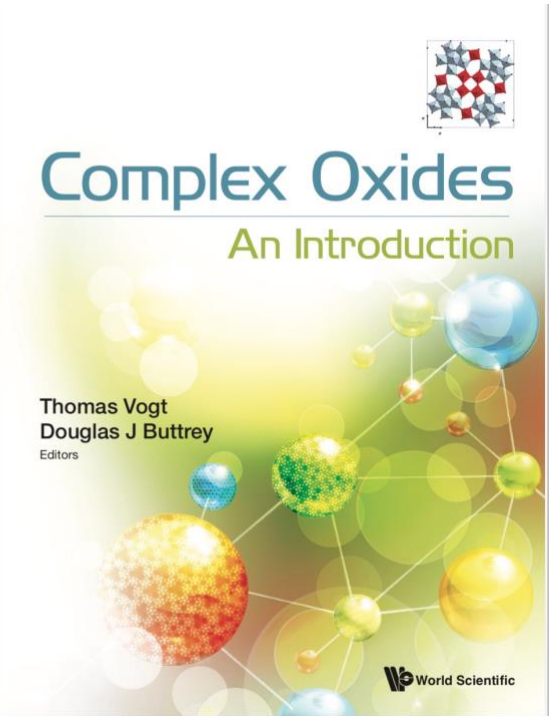

Selected Presentations:

- Higher Education and Development in Africa, Harvard University Extension, Guest lecture in Biomedical Product Development (BIOT S-225). *Scheduled for* 02 October 2024 (via Zoom).
- Collaboration in Academia, Ife Institute for Advanced Studies – IFE Summer Institute 2024 Facilitator (STEM collaboration facilitator for future academics in the arts & humanities). Workshop theme: Building Communities of Practice: Interdisciplinary Collaboration and Academic Leadership in Africa, Obafemi Awolowo University (OAU-Ife), Ile-Ife, Nigeria. 21 July – 02 August 2024. https://ias-ife.com/
- Higher Education and Development in Africa, Harvard University Extension, Guest lecture in Biomedical Product Development (BIOT S-225). 25 June 2024 (via Zoom).
- Higher Education and Development in Africa, Harvard University Extension, Guest lecture in Biochemical Engineering and Synthetic Life (ENSC S-135). 24 June 2024 (via Zoom).
- Education and Development in Africa – Focus on Nigeria, Keynote Address, Engineers Without Borders (EWB) – University of Delaware Chapter, Spring Celebration, Executive Banquet and Conference Center, Newark, DE, 28 April 2024.
- Higher Education and Development in Africa, Drexel University, Honors Seminar (HNRS 304). 11 March 2024 (via Zoom).
- Higher Education and Development in Africa, Harvard University Extension, Guest lecture in Biomedical Product Development (BIOT E-225), 07 December 2023 (via Zoom).
- Higher Education and Development in Africa, Drexel University, Honors Seminar (HNRS 304). 27 November 2023 (via Zoom).
- Controversies: Deconstructing Exploitation in Scientific Research, lead presentation for panel discussion, Ife Institute for Advanced Studies – Science 2023. Workshop theme: Decolonizing Science Research, Removing Barriers between STEM and non-STEM-Related Fields, Obafemi Awolowo University-Ife, Ile-Ife, Nigeria. 22 November 2023 (via Zoom). https://ias-ife.com/
- Ensuring Sustainable Development Through Research and Technology, Inaugural Babatunde Ogunnaike STEM Lecture, 2022 Ife Institute for Advanced Studies - Summer Institute, The Future of the Academy – Skills for Transformative Pedagogy, Theory, and Practice, 28 July 2022 (via Zoom), Obafemi Awolowo University-Ife, Ile-Ife, Nigeria. https://ias-ife.com/
- Mixed Metal Oxide Catalyst Development for Selective Oxidation and Ammoxidation of Propane, 06 December 2019, Indian Institute of Technology – Delhi, New Delhi, India
- Mixed Metal Oxide Catalyst Development for Selective Oxidation and Ammoxidation of Light Hydrocarbons, 18 September 2018, ExxonMobil Research and Engineering Company, Clinton Township, Annandale, NJ.
- Remembering Robert K. Grasselli – Reflections on Three Decades of Collaboration on Complex Oxides for Selective Oxidation, Catalysis Club of Philadelphia, 22 February 2018, Crown Plaza, Wilmington, DE. http://catalysisclubphilly.org/abstracts/remembering-robert-k-grasselli-reflections-three-decades-collaboration-complex-oxides-selective-oxidation/

- Mixed Metal Oxide Catalyst Development for Selective Oxidation and Ammoxidation of Light Alkanes, 15 June 2017, Addis Ababa University, Addis Ababa, Ethiopia
- Mixed Metal Oxide Catalyst Development for Selective Oxidation and Ammoxidation of Light Alkanes, 12 June 2017, Bahir Dar University, Bahir Dar, Ethiopia.
- Mixed Metal Oxide Catalyst Development for Selective Oxidation and Ammoxidation of Light Hydrocarbons, 09 June 2017, Plenary Lecture for the 2nd International Research Symposium on Ensuring Sustainable Development through Research and Technology, Adama, Ethiopia.
- Mixed Metal Oxide Catalyst Development for Selective Oxidation and Ammoxidation of Light Hydrocarbons, 14 April 2017, SUNY Polytechnic Institute, Albany, NY
- Mixed Metal Oxide Catalyst Development for Selective Oxidation and Ammoxidation of Light Hydrocarbons, 06 March 2017, Chemical Engineering Department Seminar at the Indian Institute of Technology –Bombay in Mumbai, India
- Nanomaterials in Chemical Engineering, 04 March 2017, Keynote Lecture for AZeotropy-2017 conference at the Indian Institute of Technology – Bombay in Mumbai, India. http://azeotropy.com/2018/about.php#
- Mixed Metal Oxide Catalyst Development for Selective Oxidation and Ammoxidation of Light Hydrocarbons, 02 March 2017, Chemical Engineering Department Seminar at the Indian Institute of Technology – Kanpur, India
- Blending Diffraction Methods with Advanced Electron Imaging for Characterization of Structure, Composition, and Dynamics of Complex Oxide Materials, 23 July 2015, African University of Science and Technology, Abuja, Nigeria
- Combining Diffraction Methods with Real Space Imaging for Characterization of Structure, Composition, and Dynamics of MoVNbTeO, 04 July 2015, 7th Irsee Symposium on Selective Oxidation Catalysis, Kloster Irsee, Irsee, Germany.
- Advances in Imaging, Diffraction, and Spectroscopies in Electron Microscopy, 01 March 2015, Invited Short Course Speaker, Catalysis Center for Energy Innovation, University of Delaware, Newark, DE.
- Characterization of Complex Molybdenum Bronze Catalysts by combining Diffraction and Real Space Methods, 27 January 2015, Invited Keynote Lecture, Total Corporate Catalysis Conference, Mercure Center Louise, Brussels, Belgium.
- Characterization of Complex Molybdenum Bronze Catalysts by combining Diffraction and Real Space Methods, 11 December 2014, Invited Seminar Speaker, Department of Materials, Oxford University, UK.
- Self-assembly and Lattice Termination in the M1 Catalyst and Related Phases, 04 September 2014, Plenary Speaker for the 3rd International Symposium on Advanced Electron Microscopy for Catalysis (EMCat14), Seeon Monastery, Bavaria, Germany
- University of Delaware Partnerships in Sub-Saharan Africa, 10 February 2014, People, Projects, and Partners Lecture Series, University of Delaware, Newark, DE
- Order and Disorder in the MoVNbTeO Selective Oxidation Catalyst, 10 October 2013, Center for Catalytic Science and Technology Annual Review, University of Delaware, Newark, DE.
- Engaging the Developing World, 09 September 2013, Science, Society, and Sandwiches Lecture Series, University of Delaware, Newark, DE.

- Order and Disorder in a new Selective Oxidation Catalyst, 16 August 2013, African University of Science and Technology, Abuja, Nigeria.
- Self-Assembly and Disorder in the Mo-V-Nb-Te-O System, 05 July 2013, 6th Irsee Symposium on Selective Oxidation Catalysis, Kloster Irsee, Irsee, Germany.
- Atomic-Level Characterization of Order and Disorder in the Mo-V-Nb-Te-O System, 10 June 2013, Keynote Lecture for the 7th World Congress on Oxidation Catalysis, St. Louis, MO.
- AAAS Science and Human Rights Workshop on access to science as an inalienable human right, considering the role of science and engineering in improving living conditions in the developing world, 23 June 2012, University of Delaware, Newark, DE. http://www.udel.edu/udaily/2013/oct/science-human-right-100212.html
- Characterization of Mixed Metal Oxide Catalysts for Selective Oxidation and Ammoxidation of Propane and Propylene, 07 August 2012, Pacific Northwest National Laboratory, Richland, WA.
- Characterization of the Mo-V-(Nb,Ta)-(Te,Sb)-O Selective Oxidation Catalyst, November 8, 2011, Université Lille - Nord de France, Cité Scientifique, France
- Advanced Characterization of Complex Catalytic Materials, 24 March 2011, BASF Corporation, Iselin, NY.
- Recent Progress using Liquid Metal Anodes in Direct Carbon Fuel Cells, 14 March 2011, CCEI Spring Symposium, University of Delaware, Newark, DE.
- Introduction to Transmission Electron Microscopy, 13 March 2011, CCEI Spring Symposium Workshop, University of Delaware, Newark, DE.
- Using Advanced Electron Microscopy to Explore Chemical and Structural Variations in the Complex Oxide Catalysts, 23 August 2010, African University of Science and Technology, Abuja, Nigeria.
- Phase Equilibria, Order, and Disorder in the MoV(Nb,Ta)TeO System, 11 June 2010, 5th Irsee Symposium on Selective Oxidation Catalysis, Kloster Irsee, Irsee, Germany.
- Using Aberration-Corrected HAADF-STEM to Explore the Mo-V-(Nb,Ta)-(Te,Sb)-O Selective Oxidation Catalyst System, 18 January 2010, Symposium on Advanced Electron Microscopy for Applications in Catalysis and Energy Research, Harnack House, Fritz-Haber Institute, Berlin, Germany
- Using Aberration-Corrected STEM Imaging to Explore Chemical and Structural Variations in the MoVNbTeO Selective Oxidation Catalyst, 13 November 2009, AIChE Annual Meeting, Nashville, TN
- Complex Molybdenum Oxides for Selective Oxidation, 28 October 2009, Inorganic Chemistry Colloquium, University of Delaware, Newark, DE
- Aberration-Corrected STEM Imaging for the Analysis of Complex Materials for Applications from Catalysis to Photovoltaics, 06 August 2009, 2iE Institute for Water and the Environment, Ouagadougou, Burkina Faso
- Developing Structural Models for Mo-Based Selective Oxidation Catalysts using High-Resolution Scanning Transmission Electron Microscopy, 09 June 2009, 21st North American Catalysis Society Meeting (21st NAM), San Francisco, CA
- Using Aberration-Corrected STEM Imaging to Explore Chemical and Structural Variations in the MoVNbTeO and Related Systems, 21 January 2009, Dept. of Anorganische Chemie, Fritz-Haber Institute of the Max Planck Society, Berlin, Germany

- Characterization of Promoted Ruthenium and Hollandite Ruthenates as Catalysts for Ammonia Decomposition, 20 January 2009, Dept. of Anorganische Chemie, Fritz-Haber Institute of the Max Planck Society, Berlin, Germany
- Exploring Structural and Compositional Variations in Nanoporous Mixed Metal Oxide Bronzes using Aberration-Corrected STEM Imaging, 12 December 2008, North East Corridor Zeolite Association (NECZA) Meeting, University of Pennsylvania, Philadelphia, PA.
- Using Aberration-corrected STEM Imaging to Explore Chemical and Structural Variations in the MoVNbTeO Oxidation Catalyst, 19 November 2008, Metropolitan New York Catalysis Society Meeting, Somerset, NJ.
- Using Aberration-corrected STEM Imaging to Explore Chemical and Structural Variations in the MoVNbTeO Oxidation Catalyst, 19 November 2008, Lummus Technology, Bloomfield, NJ.
- Using Aberration-corrected STEM Imaging to Explore Chemical and Structural Variations in the MoVNbTeO Oxidation Catalyst, 13 November 2008, Catalysis Club of Philadelphia, PA.
- Direct Observation of the MoV(Nb,Ta)TeO M1 Phase using Cs-Corrected Scanning Transmission Electron Microscopy, 23 October 2008, Center for Catalytic Science and Technology Annual Review, University of Delaware, Newark, DE.
- Characterization of Complex Oxides in the MoV(Nb,Ta)TeO System for Selective Oxidation and Ammoxidation of Light Alkanes, 19 August 2008, African University of Science and Technology, Abuja, Nigeria
- The Role of Nb (or Ta) in the Long-Range Compositional Ordering of MoV(Nb,Ta)TeO Oxidation Catalysts, May 2008, Group Five Elements Symposium, Adam Mickiewicz University, Poznań, Poland
- Characterization of Complex Oxides using Advanced Imaging and Diffraction Techniques, February 2008, Catalysis Research Center, Hokkaido University, Sapporo, Japan
- Direct Observation of the $MoVTeNbO_x$ M1 Phase Using Cs-corrected High-Resolution STEM Imaging, December 2007, Symposium in Celebration of the 75^{th} Birthday of Sir John Meurig Thomas, Fitzwilliam College, University of Cambridge, UK.
- Characterization of Promoted Ruthenium and Hollandite Ruthenates as Catalysts for Ammonia Decomposition, June 2007, Fourth Irsee Symposium on Oxidation Catalysis, Kloster Irsee, Irsee, Germany.
- An Integrated Approach toward Rational Nanocatalyst Design for Hydrogen Production, May 2007, DOE-BES Contractor's Meeting – Frontiers in Interfacial and Nano Catalysis, Wintergreen, VA.
- Nanoscale Characterization of Catalytic Materials, March 2007, University of South Carolina, Dept. of Chemical Engineering, Columbia, SC.
- Nanoscale Characterization of Catalytic Materials, January 2007, University of Rajasthan, Jaipur, India.
- Nanoscale Characterization of Catalytic Materials, March 2007, Indian Institute of Science – Chennai (Madras), Chennai, India.
- Atomic-Scale Characterization of Catalytic Materials using Transmission Electron Microscopy (TEM), October 2006, CCST Review Poster, University of Delaware.

- Characterization of Mo-V-(Nb,Ta)-Te-O Phases for Propane Ammoxidation. June 2006, ExxonMobil Corporate Strategic Research Center, Clinton, NJ.
- Characterization of the M1 and M2 Phases in the Mo-V-(Nb, Ta)-Te-O Ammoxidation Catalyst System-Unraveling the Role of Niobium and Opportunities for Design, September 2005, CBMM-Cia. Brasileira de Metalurgia e Mineracão, Araxã, MG, Brazil.
- Characterization of the M1 and M2 Phases in the Mo-V-(Nb, Ta)-Te-O Ammoxidation Catalyst System-Unraveling the Role of Niobium, Plenary Lecture, September 2005, 13th Brazilian Congress on Catalysis and 3rd Mercosul Congress on Catalysis, Iguazu Falls, PR, Brazil.
- Characterization of the M1 and M2 Phases in the MoV (Nb, Ta) TeO System for Propane (Amm)oxidation: Determination of Elemental and Valence Distributions, The Role of Vacancies, Disorder, and the Relationship between Surface and Bulk Structure in Selective Oxidation Catalysis, June 2005, Third Irsee Symposium on Selective Oxidation, Kloster Irsee, Irsee, Germany.
- Characterization of the M1 and M2 Phases in the MoV (Nb, Ta) TeO System for Propane (Amm)oxidation: Determination of Elemental and Valence Distributions, May 2005, Fifth International Symposium on Group Five Compounds, Jiminy Peak, MA.
- Stripe Order and Dynamics in Nonstoichiometric $Ln_{2-x}Sr_xNiO_{4+d}$, 30 September 2004, 4th International Conference of the Stripes Series "Stripes04" University of Rome "La Sapienza", Rome, Italy.
- Structural Characterization of Phases in the MoVNbTeO Propane Ammoxidation Catalyst, March 2004, E. V. Murphree Award Symposium in Honor of James E. Lyons, Anaheim, CA.
- Complex Oxide Materials for Catalysis by Design, March 2004, American Physical Society, Montreal, Canada.
- Phase Equilibria and Phase Separations in $Ln_{2-x}Sr_xNiO_{4+\delta}$ (Ln=La, Nd, and Y), March 2004, American Physical Society, Montreal Canada.
- Characterization of M_1 and M_2 Phases in the Mo-V-Nb-Te-O Propane Ammoxidation Catalyst, October 2003, Center for Catalytic Science and Technology Annual Review, University of Delaware, Newark, DE.
- Characterization of M1 and M2 Phases in the Mo-V-Nb-Te-O Propane Ammoxidation Catalyst, September 2003, American Chemical Society, New York City, NY.
- Structural Characterization of Phases in the MoVNbTeO Propane Ammoxidation System, July 2003, B. E. Warren Award Symposium on Honor of Takeshi Egami, American Crystallographic Association, Cincinnati, OH.
- Characterization of Phases in the MoVNbTeO Propane Ammoxidation Catalyst System, April 2003, Transmission Electron Microscopy in Catalysis, University of Delaware, Newark, DE.
- Phase Separation in Oxygen Doped $La_{2-x}Sr_xNiO_{4+\delta}$ ($0 < x < 0.12$), March 2003, American Physical Society, Austin, TX (presented by coauthor J. M. Tranquada).
- Structural Characterization of Crystalline Phases Present in the Mo-V-Nb-Te Oxide Propane Ammoxidation Catalyst, September 2002, American Chemical Society, Boston MA.
- Structural Characterization of Crystalline Phases Present in the Mo-V-Nb-Te Oxide Propane Ammoxidation Catalyst, September 2002, Rohm and Haas, Norristown PA.

- Structural Characterization of Phases in the MoVNbTeO Propane Ammoxidation Catalyst, June 2002, 2nd Irsee Symposium on Selective Oxidation, Schwäbisches Bildungszentrum, Kloster Irsee, Germany.
- Compositional and Structural Trends in the Bismuth Molybdates, June 2000, 1st Irsee Symposium on Selective Oxidation, Schwäbisches Bildungszentrum, Kloster Irsee, Germany.
- Phase Equilibria and Phase Separations in Layered Nickelates, March 2000, Purdue University, W. Lafayette, IN.
- Phase Separations and Charge Ordering in Layered Nickelates, July 1998, American Crystallographic Association Annual Meeting, Albuquerque, NM.
- Phase Equilibria and Phase Separations in Layered Nickelates, July 1998, Michigan State University, E. Lansing, MI.
- Applications of Analytical Electron Microscopy in Solid State Chemistry., June 1996, National Science Foundation Workshop on Solid State Chemistry, State University of New York, Binghamton, NY.
- Characterization of Composition/Structure/Property Relationships in Oxides., May 1996, Atlantic Regional Meeting of the American Chemical Society, Villanova University, Villanova, PA.
- Composition/Structure Relationships in the Bismuth Molybdate System., 06 May 1996, DuPont, Wilmington, DE.
- Applications of Analytical Electron Microscopy in Solid State Chemistry, 08 June 1995, National Science Foundation Workshop on Solid State Chemistry, State University of New York, Binghamton, NY.
- Stoichiometry, Structure, and Properties of $La_2NiO_{4+/-\delta}$ and $La_{2-x}Sr_xNiO_{4+/-\delta}$., 11 November 1994, 7th International Conference on Superconductivity, Kita-Kyushu City, Fukuoka, Japan.
- Structural Analysis of Complex Oxide Materials., 27 October 1994, ALEX West Conference, San Jose, CA.
- Composition-Structure Relationships in Complex Oxides of Molybdenum and Vanadium., 12 October 1994, CCST Annual Review, Clayton Hall, University of Delaware, Newark, DE.
- Ordering of Holes and Spins in $La_2NiO_{4.125}$ and $La_{1.8}Sr_{0.2}NiO_{4.00}$., October 1994, International Conference on Neutron Scattering, Sendai, Japan.
- Composition-Structure Relationships in the Bismuth Molybdate System., 30 September 1994, DuPont Central Research and Development, Wilmington, DE.
- Electrochemical Intercalation of Oxygen in $La_2NiO_{4+\delta}$, July 1994, Gordon Conference on Solid State Chemistry, Wolfeboro, NH.
- Applications of Analytical Electron Microscopy in Solid State Chemistry, June 1994, National Science Foundation Workshop on Solid State Chemistry, State University of New York, Binghamton, NY.
- Simultaneous Ordering of Holes and Spins in $La_2NiO_{4.125}$ and $La_{1.8}Sr_{0.2}NiO_4$, 21 March 1994, American Physical Society March Meeting, Pittsburgh, PA.
- Composition-Structure-Property Relationships in Layered Nickelates, December 1993, Indian Institute of Technology, Madras, India.

- Composition-Structure-Property Relationships in Layered Nickelates, December 1993, Conference on Current Topics in Solid State Chemistry, Indian Institute of Science, Bangalore, India.
- Composition-Structure Relationships in the Bismuth Molybdate System., October 1993, CCST Annual Review, Clayton Hall, University of Delaware, Newark, DE..
- Phase Equilibria and Structure in Low Dimensional Oxides of Nickel, May 1993, American Crystallographic Association Annual Meeting, Albuquerque, NM.
- Phase Equilibria and Structure in Low Dimensional Oxides of Nickel, April 1993, Chemical Engineering/Materials Science Seminar, University of Pennsylvania, Philadelphia, PA.
- Phase Equilibria and Structure in Low Dimensional Oxides of Nickel, March 1993, American Physical Society March Meeting, Seattle, WA.
- Phase Equilibria and Structure in Low Dimensional Oxides of Nickel, March 1993, McMaster University, Hamilton, Ontario Canada.
- Phase Equilibria and Structure in Low Dimensional Oxides of Nickel, April 1992, American Chemical Society, San Francisco, CA.
- Polarized Infrared Study of the Abma-$P4_2/ncm$ Phase Transition in Stoichiometric La_2NiO_4, March 1991, American Physical Society March Meeting, Seattle, WA
- Phase Equilibria and Defects in Complex Oxides of Nickel and Molybdenum., May 1991, Mobil/Delaware Symposium, Clayton Hall, University of Delaware, Newark, DE
- Synthesis and Properties of Low-Dimensional Oxides of Nickel, January 1991, Solid State Physics Seminar, Brookhaven National Laboratory, Upton, NY
- Phase Equilibria in Oxide Materials., October 1990, DuPont - University of Delaware Chemical Engineering Symposium, Newark, DE.
- Synthesis, Structure, and Magnetism in One and Two Dimensional Oxides of Nickel, September 1990, Solid State Physics Seminar, University of Delaware, Newark, DE.
- Synthesis and Characterization of a New Linear Characterization of a New Linear Chain Oxide, Y_2BaNiO_5 (Poster Presentation), July 1990, Gordon Conference on Solid State Chemistry, Plymouth, NH.
- Physical Properties of Layered Lanthanide Nickelates., April 1989, Solid State Physics Seminar, Department of Physics, University of Virginia, Charlottesville, VA
- Influence of Stoichiometry on Structure and Magnetism in $La_2NiO_{4+\delta}$ and Pr_2NiO_4 (Poster), March 1989, Gordon Conference on Superconductivity, Ventura, CA.
- Crystal Growth and Characterization of Layered Lanthanide Nickelates., March 1989, Inorganic Seminar, Department of Chemistry and Biochemistry, University of Delaware, Newark, DE.
- Composition-Structure-Property Relations in Layered Perovskites of Nickel., December 1988, Inorganic Seminar, Department of Chemistry, Brown University, Providence, RI.
- High Temperature Superconductivity - A Renewed Challenge., November 1988, Delaware Academy of Science, Super-Science Symposium, Newark, DE.
- Structure and Magnetism in Layered Lanthanide Nickelates, September 1988, E. I. du Pont de Nemours & Co., Experimental Station, Wilmington, DE.
- Crystal Growth and Characterization of Lanthanide Nickelates, June 1988, W. R. Grace & Company, Washington Research Center, Columbia, MD.

- Single Crystal Growth and Characterization of Oxides, June 1987, 21st Great Lakes Regional ACS Meeting, Chicago, IL.
- Structure/Property Relationships in the Layered Lanthanide Nickelates, June 1987, Allied Corporation, Morristown,
- Relationships Between Structure and Physical Properties of Layered Lanthanide Nickelates, April 1987, School of Materials Engineering, Purdue University, West Lafayette, IN.
- Structural Relationships Between Bismuth Molybdate Phases - Implications for Catalysis and Fast Ion Conduction., February 1987, School of Materials Engineering, Purdue University, West Lafayette, IN.
- Structural Relationships Between Bismuth Molybdate with References to Selective Oxidation Catalysis., July 1986, The Standard Oil Company of Ohio (Sohio) Research Center, 4440 Warrensville Center Road, Cleveland, OH.
- Physical Properties of Layered Lanthanide Nickelates., December 1985, Winter Workshop in Solid State Chemistry, Indian Institute of Science, Bangalore, India.
- Structural Relationships Between Bismuth Molybdate Phases., December 1985, Golden Jubilee Symposium on Solid State Chemistry, Indian National Science Academy, New Delhi, India.
- Crystal Growth, Nonstoichiometry, and Physical Properties of Quasi-Two-Dimensional Transition Metal Oxides with the K_2NiF_4-type Structure, October 1984, Department of Physical Chemistry, University of Cambridge, Cambridge, England.
- TEM Study of Quasi-Two-Dimensional Transition Metal Oxides, April 1984, American Ceramic Society Meeting, Pittsburgh, PA.