Curriculum Vitae

Bruce E. Koel

Professor of Chemical and Biological Engineering
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Birthdate: June 30, 1955
Birthplace: Norton, Kansas

Education: Ph.D., Chemistry, *The University of Texas at Austin,* 1981
M.S., Chemistry, *Emporia State University,* 1978
B.S., Highest Honors, Chemistry, *Emporia State University,* 1976

Research Activities: Surface chemistry and interfacial processes. Heterogeneous catalysis-- controlling selectivity in hydrocarbon reactions, primarily for bimetallic Pt alloys; Electrochemistry-- novel alloy electrodes for oxygen reduction in fuel cells; Liquid-solid interfaces-- development of Rutherford backscattering (RBS) for nanometer characterization; Environmental remediation-- heavy metal sequestration by core-shell iron nanoparticles; Plasma-facing materials-- reactions at surfaces of Li; Scanning probe microscopy, STM and AFM; Electron and ion spectroscopy for surface analysis.

Professional Positions:
Professor of Chemical and Biological Engineering, *Princeton University*, 2011—
Associated Faculty, Princeton Inst. Sci. and Tech. of Materials (PRISM), *Princeton U.*, 2011—
Associated Faculty in Mechanical and Aerospace Engineering, *Princeton University*, 2011—
NSTX Collaborator, Princeton Plasma Physics Laboratory (PPPL), 2011—
Associated Faculty in Chemistry, *Princeton University*, 2011—
Adjunct Professor of Chemistry, *Lehigh University*, 2011
Interim Vice President, Assoc. Provost for Research & Grad. Studies, *Lehigh Univ.*, 2008-2010
Interim Vice Provost for Research, *Lehigh University*, 2007-2008
Professor of Chemistry, *Lehigh University*, 2005-2010
Member, Center for Advanced Materials and Nanotech. (CAMN), *Lehigh Univ.*, 2005-2010
Visiting Research Collaborator, Dept. of Chemical Engineering, *Princeton University,* 2004-05
Chairman, Department of Chemistry, *University of Southern California*, 1998-2001
Visiting Scholar, Department of Chemistry,*Cambridge University,* Jan. - June 1996
Professor (Adjunct) of Materials Science, *University of Southern California*, 1995-2005
Founding Member, Laboratory for Molecular Robotics, *Univ. of Southern California*, 1994-2005
Professor of Chemistry, *University of Southern California*, 1993-2005
Associate Professor of Chemistry, *University of Southern California*, 1990-1993
Associate Professor of Chemistry, *University of Colorado, Boulder,* 1989
Fellow, Coop. Inst. for Research in Environmental Sciences (CIRES), *U. Colorado*, 1983-1989
Assistant Professor of Chemistry, *University of Colorado, Boulder,* 1983-1989
Miller Postdoctoral Fellow, *University of California, Berkeley,* 1981-1983

Selected Honors, Awards and Fellowships:
EaStCHEM Intern'l Visiting Fellowship lecturer, *U. of Edinburgh & St. Andrews*, Scotland 2008
George A. Olah Award in Hydrocarbon or Petroleum Chemistry, Amer. Chem. Soc. (ACS) 2007
Fellow of the American Association for the Advancement of Science (AAAS), 2004
Professeur Invite´, *University de Paris-Sud*, Orsay, France, 2001
AIST Guest Researcher Awards, *Osaka Nat'l Res. Inst.*, Osaka, Japan, 1999 and 2000
Keynote Address, Brazilian Vacuum Society Annual Conf., Sao Jose dos Campos, Brazil, 2000
Fellow of the American Vacuum Society (AVS), 1999
Distinguished Alumnus of *Emporia State University*, 1998
Fellow of the American Physical Society (APS), 1996
Who's Who (Marquis; Strathmore; et al.), 1996—
Union Carbide Innovation Research Awards, 1990 and 1991
Alfred P. Sloan Research Fellowship, 1990
Exxon Education Foundation Award, 1987
Junior Faculty Development Award, *University of Colorado, Boulder*, 1985
Dreyfus Foundation Grant for New Faculty, 1983
Miller Institute Postdoctoral Fellowship, *University of California, Berkeley*, 1981
ACS Division of Colloid and Surface Chemistry Proctor and Gamble Fellowship, 1980
National Science Foundation Traineeship; University Fellowship, *Univ. Texas, Austin,* 1978

Membership in Professional Societies: American Association for the Advancement of Science (AAAS), American Chemical Society (ACS), American Institute of Chemical Engineers (AIChE), American Physical Society (APS), American Vacuum Society (AVS), Catalysis Club of Philadelphia (CCP), Catalysis Society of Metropolitan New York, Council for Chemical Research (CCR), The Electrochemical Society (ECS), Materials Research Society (MRS), Sigma Xi

Editorial Services to Scholarly Publications:
Guest Member, Editorial Committee, *Annual Review of Physical Chemistry*, Vol. 61(2010), 2008
Member, Editorial Advisory Board of *Langmuir*, 1993-2001
Co-Editor, Proceed. Symp. on Bimetallic Surface Chemistry & Catalysis, *Langmuir*, **4**(1987)

Referee for: ACS Nano, Applied Surface Science, Catalysis Letters, Catalysis Today, Chemistry of Materials, J. Catalysis, J. Chemical Physics, J. Electron Spectroscopy and Related Phenomena, J. Physical Chemistry, J. American Chemical Society, J. Vacuum Science and Technology, Langmuir, Physical Chemistry Chemical Physics, Physical Review, Physical Review Letters, Science, and Surface Science

Selected Professional Activities (1992-present):
Member, Science Advisory Committee (SAC) of the Center for Functional Nanomaterials (CFN) at Brookhaven National Laboratory (BNL) , 2012—
Member, Governing Board, Council for Chemical Research (CCR), 2011—
Member, Advisory Committee, QEXAFS/XRD beamline, NSLS-II, 2010
University Leader, CCR Research Collaboration Action Network (RC-AN), 2009-10
Affiliated Faculty of the Catalysis Center for Energy Innovation (CCEI), University of Delaware, an Energy Frontier Research Center funded by the U.S. DOE, Office of Science, 2009—
Member, 2009 Physical Electronics Conference Meeting Local Program Committee, 2009
Member, DOE Materials Science Merit Review Panel, National Energy Technology Laboratory (NETL), 2009
Member, Tech. Advisory Committee, PA NanoMaterials Commercialization Center, 2008-10

Member, CCR Research Collaboration Action Network (RC-AN), 2007-10
Member, International Advisory Board, Chemical and Energy Sciences, NSLS-II, 2007-10
Member, Board of Directors, Ben Franklin Technology Partners of Northeastern PA, 2007-10
Member, Lehigh Nanotechnology Network (LNN) Executive Board, 2007-10
Member, NSF SBIR/STTR Program Industrial Innovation & Partnerships Panel, 2007
Member, General Committee of the Physical Electronics Conference, 2007-10
Member, ACS Awards Committees, 2007-08
Member, NSF Analytical and Surface Chemistry Panel, 2007
Instructor, Scanning Probe Microscopy: From Fundamentals to Advanced Applications Course, Lehigh Microscopy School, 2006-10
Member, CCR 2006 Annual Meeting Planning Committee, 2005
ARO Chemistry Position Workshop, Chemical Sciences Div., North Carolina St. Univ., 2004
Member, DOE Materials Chemistry Review Team, Lawrence Berkeley Nat'l Laboratory, 2003
Chair, AVS Surface Science Division, 2000 and 2001
Member, Program Committee, AVS 47th Int'l Symposium & NANO-6, Boston, MA, 2000
2000 SET (Science, Engineering, and Technology) Congressional Visits Day, Washington, DC
AVS Strategic Planning Workshop, Chicago, IL, 2000
Member, Long Range Planning Committee, AVS Surface Science Division, 1998-2000
Reviewer, 2000 Western Assoc. of Grad. Schools (WAGS) Distinguished Masters Thesis Award
Chair, California Catalysis Society Annual Meeting, 1999
Congressional Visits Day, CCR, Washington, DC, 1999
Chair, AVS Surface Science Division Program Committee, 1999
Member, CCR Government Relations Committee, 1998-2005
Chair, Leading Edge Symposium, 31st Annual Symp. of the Southern Calif. AVS, Orange, 1998
Member, Mort Traum Award Committee, AVS, 1997
Member, Executive Committee & Program Committee, AVS Surface Science Division, 1997-99
Member, Gordon Research Conference Council, 1997
Chair, Chemical Reactions at Surfaces Gordon Research Conference, 1997
Chair, Stauffer Symposium on Surface Chemistry, 1995
Vice-Chair, Chemical Reactions at Surfaces Gordon Research Conference, 1995
Member, Mort Traum Award Committee, AVS, 1994
Member, Review Panel for DOE Distinguished Postdoctoral Research Program, 1993
Member, Canvassing Committee for the Arthur W. Adamson Award for Distinguished Service in the Advancement of Surface Chemistry, ACS, 1992-95
Co-chair, 8th DOE-BES Heterogen. Catalysis & Surface Chem. Mtg., LA, 1992
Chair, P&G Fellowship Committee, Division of Colloid and Surface Chemistry, ACS, 1992
Member, P&G Fellowship Committee, Div. of Colloid and Surface Chemistry, ACS, 1991-93
Chair, Organizing Committee, Chemical Reactions at Surfaces Gordon Conference, 1991-93
Co-chair, Continuing Symposium on Molecular Processes at Solid Surfaces, Division of Colloid and Surface Chemistry of the ACS, 1989-93

Consulting: Surface Chemistry Discoveries, Inc., 2005; Arkema (ATOFINA Chemicals, Inc.), 2004; Atherton Quantum Insight, ChevronTexaco, 2003-05; Jet Propulsion Laboratory, 1998-2000; Dow Chemical Co., 1995; Chem Alert Corp., 1993-95; Burge and Associates, 1992-94; CLS-1, Los Alamos National Lab., 1992-94; CLS-2, Los Alamos National Lab., 1984-92; Hewlett-Packard, 1985-89; J&A Associates, 1986.

Patent: *Layered Nanofabrication*, U.S. Patent No. 6,508,979 (2003) A. A.G. Requicha, B. E. Koel, R. Resch, D. Lewis, M. E. Thompson

Invited Talks at Technical Meetings (2000-present):

2012 ACS Natl. Meeting, 244th, ENFL Symp.: Frontiers in Energy and Fuels, Philadelphia, PA
2012 Annual Symposium of The Catalysis Society of Metro. New York, Clinton, NJ

2011 Int'l Symposium and the 3rd Iwasawa Conference on Catalysis and Surface Science for Efficient Utilization of Carbon Resources and Related Topics, Xiamen Univ., China
Int'l Symposium on Controlled Surface Reactions, 41st Summer Annual Conf. of the Korean Vacuum Society, Daegu, Korea

2010 ACS Natl. Meeting, 240th, CATL Symp.: Surface Science of Catalysis, Boston, MA
ACS Natl. Meeting, 239th, George A. Olah Award Symposium in Honor of Peter C. Stair, San Francisco, CA

2009 EPI Workshop, Particles for Emerging Needs: Directed Synthesis and Characterization toward Biomedical and Catalytic Applications, Lehigh University, Bethlehem, PA
ACS Natl. Meeting, 237th, George A. Olah Award Symposium in Honor of Cynthia M. Friend, Salt Lake City, UT

2008 AIChE Annual Meeting, A Century of Surface Science and Catalysis, Philadelphia, PA
ACS Natl. Meeting, 236th, Symposium in Memory of Mike White, Philadelphia, PA
20th International Conference on the Application of Accelerators in Research and Industry (CAARI 2008), Fort Worth, TX
ACS Natl. Meeting, 235th, George A. Olah Award Symposium in Honor of Israel E. Wachs, New Orleans, LA
ACS Natl. Meeting, 235th, Arthur W. Adamson Award Symposium in Honor of Francisco Zaera, New Orleans, LA
ACS Natl. Meeting, 235th, Symposium Honoring Priestley Medal Winner Gabor Somorjai, New Orleans, LA

2007 46th Eastern Analytical Symp. & Exhib., Catalysis and Surface Sci. Symp., Somerset, NJ
ACS Natl. Mtg., 233rd, Div. of Colloid and Surface Chemistry Award Symp., Chicago, IL
ACS Natl. Mtg., 233rd, George A. Olah Award Symp. in Honor of Bruce E. Koel, Chicago, IL

2006 2006 AIChE Annual Meeting, Topics in Surface Science and Catalysis, In Honor of Robert J. Madix, San Francisco, CA
ACS Natl. Meeting, 232nd, Dynamics of Single Atoms, Molecules and Clusters on Surfaces Symposium, San Francisco, CA
Spring Symposium of the New York Catalysis Society, Bethlehem, PA
4th Annual Univ. of California Surface Science and Applic. Symposium, Berkeley, CA

2005 AVS 52nd Internat'l Symp. & Exhib., Bimetallic Surfaces Symposium, Boston, MA
207th Mtg. of The Electrochemical Society, Electrocatalysis Symp., Quebec City, Canada
Southern California Symposium on Surface Science, University of California, Irvine

2004 AVS, Rocky Mountain Annual Symp., RMAVS 2004, Nanostructured Materials Symposium, Golden, CO
BioNEMS Symposium, sponsored by the Center for Interdisciplinary Research of USC and the National Cancer Institute (NCI), Los Angeles, CA
ACS Natl. Meeting, 227th, Vibrations at Surfaces Symposium, Anaheim, CA
2nd Annual Univ. of California Surface Science and Applic. Symposium, San Diego, CA

2003 204th Meeting of The Electrochemical Society, Electrochemistry Symposium in Memory of Michael Weaver, Orlando, FL

77th ACS Colloid and Surface Science Symposium, Atlanta, GA
ACS Natl. Meeting, 225th, Mechanistic Surface Chemistry Symposium, New Orleans
ACS Natl. Meeting, 225th, Electrochemistry and Surface Science Symposium in Memory of Mike Weaver, New Orleans

2002 ACS Natl. Meeting, Nanoscale Studies of Surface Phenomena Symposium, Orlando
Int'l Technol. Service Mission on Nanotechnology to West Coast USA, Los Angeles

2001 Molecular Visualization in Science Education Workshop, NSF, Arlington
Int'l Collaboration Programme, Catalysis of Gold Nanoparticles Deposited on Titanium Oxides, AIST, 2000, Osaka Nat'l Research Inst., Osaka, Japan
Gordon Conference on Chemical Reactions at Surfaces, California.
ACS Natl. Meeting, 221st, Adamson Award Symp. Honoring J. Michael White, San Diego
Workshop on Nanotechnology: Opportunity and Challenge for Industry, LARTA, CNSI, UCLA, Los Angeles
3rd Int'l Symposium on Electronic and Atomic Structure (ISEAS-3) Tamkang Univ., Taiwan

2000 ACS Natl. Meeting, 219th, Surface Chemistry Symposium Honoring Gabor A. Somorjai, San Francisco
Keynote Address, Brazilian Vacuum Society Annual Conf., Sao Jose dos Campos, Brazil
11th DOE/BES Heterogeneous Catalysis and Surface Science Contractors Mtg., Rockville, Maryland, 2000
21st Century Chemical Catalysis: A Symposium in Honor of Wolfgang Sachtler & Tobin J. Marks, Ipatieff Professors of Chemistry, Northwestern Univ., Evanston
FEA Cathodes for Electrodynamic Tethers Workshop, JPL, Pasadena
4th Int'l Chemical Congress of Pacific Basin Societies (Pacifichem 2000), Symposium on Electrochemical Surface Science at Molecular/Atomic Resolution, Honolulu, Hawaii
4th Int'l Chemical Congress of Pacific Basin Societies (Pacifichem 2000), Symposium on Photon and Electron Induced Processes on Surfaces, Honolulu, Hawaii

Invited Lectures at Universities and Laboratories (2000-present):

2012 Rutgers U./Princeton U. Joint Seminar, Nanotechnology for Clean Energy IGERT

2011 University of Notre Dame, Notre Dame, IN, Department of Chemistry and Biochemistry
Indiana University, Bloomington, IN, Department of Chemistry
Clemson University, Clemson, SC, Dept. of Chem. and Biomolec. Engineering (ChBE)
Korea Advanced Institute of Science and Technology (KAIST), Daejeon, Korea, EEWS-MIRC-KINC Distinguished Lecture
Seoul National University, Seoul, South Korea, Department of Chemistry
PPPL, Princeton, NJ, Boundary Physics Science Focus Group (BPSFG)
University of Wyoming, Laramie, WY, Department of Chemistry
Iowa State University, Ames, IA, Department of Chemistry
Princeton Plasma Physics Laboratory (PPPL), Princeton, NJ, PPPL Colloquium

2010 Yeshiva University, New York City, Department of Physics
Princeton University, Joint Depts. of Chem. Bio. Engin., and Mech. and Aero. Engin.

2008 University of Edinburgh, Edinburgh, Scotland, Department of Chemistry
St. Andrews University, St. Andrews, Scotland, Department of Chemistry
Univ. of Pennsylvania, Philadelphia, Lab. for Research on the Struct. of Matter (LRSM)

2007 Brown University, Providence, Joint Solid Mechanics/Materials Seminar
ExxonMobil Corporate Strategic Research Laboratories, Clinton
Air Products and Chemicals, Inc., Corporate Research Services Dept., Allentown, PA

Università degli Studi di Napoli Federico II, Napoli, Italy, Dipartimento di Chimica
University of Florida, Gainesville, Department of Chemical Engineering
Georgetown University, Washington, DC, Department of Chemistry
Lebanon Valley College, Annville, PA, Department of Chemistry
Carnegie Mellon University, Pittsburgh, Department of Chemical Engineering
Yale University, New Haven, Department of Chemical Engineering

2006 Temple University, Philadelphia, Department of Chemistry
Johns Hopkins University, Baltimore, Department of Chemistry
Thomas Jefferson University, Philadelphia
Air Products and Chemicals, Inc., Corporate Research Services Dept., Allentown, PA

2005 Brookhaven National Laboratory (BNL), Upton, Chemistry Department
Lehigh University, Bethlehem, Dept. of Chemistry, Undergraduate Research Seminar
Lehigh University, Bethlehem, Department of Chemistry
Rutgers, The State Univ. of New Jersey, Piscataway, Inst. Adv. Mat. and Dev. (IAMD)

2004 Arkema (ATOFINA Chemicals, Inc.), Philadelphia, Additives Group
ExxonMobil Corporate Strategic Research Laboratories, Clinton
Columbia University, New York, Department of Chemistry
Princeton University, Princeton Department of Chemistry
Rutgers, The State Univ. of New Jersey, Piscataway, Dept. of Chemistry and LSM
Princeton University, Princeton, Department of Chemical Engineering
Lehigh University, Bethlehem, Department of Chemistry
University of Delaware, Newark, Department of Chemistry
Princeton University, Princeton, Department of Chemical Engineering
University of Pennsylvania, Philadelphia, "Frontiers in Materials" lecture, LRSM
Princeton University, Princeton, Depts. of Chemistry, Chem. Engineering, and PRISM
University of California, Los Angeles, Department of Materials Science

2003 Pacific Northwest National Laboratory (PNNL), Pasco, Chemistry Division and EMSL
University of Illinois, Urbana-Champagne, IL, Department of Chemistry

2002 California Institute of Technology (CIT), Pasadena, Department of Materials Science
University of Kansas, Lawrence, Department of Chemistry
Sandia National Laboratories (SNL), Livermore, Thin Film and Interface Science
University of California, Berkeley, and Lawrence Berkeley Laboratory (LBL)
Trojan Chemistry Club, University of Southern California, Department of Chemistry

2001 Osaka National Research Institute (ONRI), Ikeda, Japan
University of Tokyo, Japan, Department of Chemistry
Tokyo Institute of Technology (TIT), Nagatsuta, Tokyo, Japan
Saitama University, Tokyo, Japan
Waseda University, Tokyo, Japan, Department of Chemistry
University of California, San Diego, Department of Chemistry
Universite Paris Sud, Orsay, France, LCAM (lab. des collisions atom. et moleculaires)
University of California, Los Angeles, Department of Chemistry

2000 California Institute of Technology (CIT), Pasadena, Chemical Physics Seminar
University of Wisconsin, Madison, Department of Chemical Engineering
ITA-San Jose de Campos, Brazil
Campinas University, Campinas, Brazil
University of Northern Colorado, Greeley, Department of Chemistry
Colorado State University, Fort Collins, Department of Chemistry
University of Colorado, Boulder, Department of Chemistry

PUBLICATIONS

254. "Electrochemical and Spectroscopic Study of Novel Cu and Fe-based Catalysts for Oxygen Reduction in Alkaline Media, Q. He, X. Yang, R. He, A. Bueno-López, H. Miller, X. Ren, and W. Yang and B. E. Koel, *J. Power Sources*, accepted.

253. "Monolayer Au Electrocatalysts for Oxygen Reduction: Bridging the Materials Gap", X. Yang, T. Feng, H. Wang, W. Chen, B. E. Koel and R. A. Bartynski, *J. Amer. Chem. Soc.*, to be submitted.

252. "Ge overlayer and surface alloy on Pt(100) studied via alkali ion scattering spectroscopy, X-ray photoelectron spectroscopy, and x-ray photoelectron diffraction", T. Matsumoto, C.-S. Ho, M. Batzill, and B. E. Koel, *Phys. Rev. B*, to be submitted.

251. "Activation of tungsten carbide catalysts by use of an oxygen plasma pretreatment", X. Yang, Y. C. Kimmel, J. Fu, B. E. Koel and J. G. Chen, *ACS Catalysis*, in press.

250. "Intra-particle reduction of arsenite (As(III)) by nanoscale zerovalent iron (nZVI) investigated with in situ X-ray absorption spectroscopy", W. Yan, R. Vasic, A. Frenkel and B. E. Koel, *Environ. Sci. Technol.*, in press. Articles ASAP (As Soon As Publishable) Publication Date (Web): February 1, 2012 (Article) DOI: 10.1021/es2039695.

249. "Nano-faceted C/Re(11-21): Fabrication, Structure and Template for Synthesizing Nanostructured Model Pt Electrocatalyst for Hydrogen Evolution Reaction", X. Yang, B. E. Koel, H. Wang, W. Chen, and R. A. Bartynski, *ACS Nano*, **6**(2), 1404-1409 (2012).

248. "As(III) sequestration by iron nanoparticles (nZVI): Study of solid-phase redox transformations with X-ray Photoelectron Spectroscopy (XPS)", W. Yan, M. A. Ramos, B. E. Koel, and W.-X. Zhang, *J. Phys. Chem. C*, **116**(9), 5303-5311 (2012).

2011

247. "Role of Surface Iron in Enhanced Activity for the Oxygen Reduction Reaction on a $Pd_3Fe(111)$ Single-Crystal Alloy", X. Yang, J. Hu, J. Fu, R. Wu, and B. E. Koel, *Angew. Chem. Internat. Ed.*, **50**(43), 10182-10185 (2011).

246. "A novel CuFe-based catalyst for the oxygen reduction reaction in alkaline media", Q. He, X. Yang, X. Ren, B. E. Koel, N. Ramaswamy, S. Mukerjee, and R. M. Kostecki, *J. Power Sources*, **196**(18), 7404-7410 (2011).

2010

245. "Multi-tiered distributions of arsenic in iron nanoparticles: Observations of dual redox functionality enabled by a core-shell structure", W. Yan, M. A. Ramos, B. E. Koel, and W.-X. Zhang, *Chem. Comm.*, **46**(37), 6995-6997 (2010).

244. "Studies of ethylene oxide adsorption on Pt-Sn alloys with TPD, HREELS, UPS and DFT calculations", J. Kim, J. Fu, S. Podkolzin, and B. E. Koel, *J. Phys. Chem. C*, **114**(40), 17238–17247 (2010).

243. "Adsorption and Decomposition of Cyclohexanone ($C_6H_{10}O$) on Pt(111) and the (2×2) and (√3×√3)R30°-Sn/Pt(111) surface alloys", J. Kim, L. A. Welch, A. Olivas, S. J. Podkolzin, and B. E. Koel, *Langmuir*, **26**(21), 16401–16411 (2010).

242. "Formation of Pd monomers and dimers on a single crystal $Pd_3Fe(111)$ surface", X. Yang, J. Hu, R. Wu and B. E. Koel, *J. Phys. Chem. Lett.*, **1**(16), 2493-2497 (2010).

241. "Surface Structure of $Pd_3Fe(111)$ and Effects of Oxygen Adsorption", X. Yang, L. A. Welch, J. Fu and B. E. Koel, in *Catalytic Materials for Energy, Green Processes and Nanotechnology*, edited by C-Y. Mou, J. Liu, H.H. Kung, S. Dai (Mater. Res. Soc. Symp. Proc. Vol. **1217**, Warrendale, PA, 2010), 1217-Y08-43.

240. "Influence of phosphate anion adsorption on the kinetics of oxygen reduction on low index Pt(hkl) single crystals", Q. He, X. Yang, W. Chen, S. Mukerjee, B. E. Koel, S. Chen, *Phys. Chem. Chem. Phys.*, **12**, 12544-12555 (2010).

239. "Modification of active sites on YSZ(111) by yttria segregation", J. Lahiri, A. Mayernick, S. L. Morrow, B. E. Koel, A. C. T. van Duin, M. J. Janik, and M. Batzill, *J. Phys. Chem. C*, **114(13)**, 5990-5996 (2010).

238. Chapter 2 "Structure, Characterization and Reactivity of Pt-Alloy Surfaces", B. E. Koel, in *Model Systems in Catalysis: From Single Crystals and Size Selected Clusters to Supported Enzyme Mimics,* R. M. Rioux (Ed.), (Springer, 2010), pp. 29-50.

2009

237. "Formation of Ge-Pt layer compound on Pt(100)", T. Matsumoto, C.-S. Ho, and B. E. Koel, *J. Phys. Chem. C*, **113(50)**, 21019-21021 (2009).

236. "Improving Electrocatalysts for O_2 Reduction by Fine-tuning the Pt-support Interaction: Pt Monolayer on the Surfaces of a $Pd_3Fe(111)$ Single-Crystal Alloy", W.-P. Zhou, X. Yang, M. Vukmirovic, B. E. Koel, J. Jiao, G. Peng, M. Mavrikakis, and R. Adzic, *J. Amer. Chem. Soc.*, **131(35)**, 12755-12762 (2009).

235. "Simultaneous Oxidation and Reduction of Arsenic by Zero-Valent Iron Nanoparticles: Understanding the Significance of the Core-Shell Structure", M. A. Ramos, W. Yan, X.-Q. Li, B. E. Koel, and W.-X. Zhang, *J. Phys. Chem. C*, **113(33)**, 14591-14594 (2009).

234. "Probing selectivity over Pt-Sn catalysts in reactions of *n*-C_6 hydrocarbons: Adsorption and reactivity of *n*-hexane, 1-hexene, and 1,5-hexadiene on Pt(111) and Sn/Pt(111) surface alloys", H. Zhao and B. E. Koel, *J. Phys. Chem. C*, **113(23)**, 18152-18162 (2009).

233. "Site-blocking effects of preadsorbed H on Pt(111) probed by 1,3-butadiene adsorption and reaction", H. Zhao, L. A. Welch, and B. E. Koel, *Surface Sci.*, **603(23)**, 3355-3360 (2009).

232. "STM and LEED observations of a c(2×2) Ge overlayer on Pt(100)", T. Matsumoto, M. Batzill, and B. E. Koel, *Surface Sci.,* **603(15)**, 2252-2262 (2009).

231. "Formation and Structure of a (√19×√19)R23.4°-Ge/Pt(111) Surface Alloy", C.-S. Ho, S. Banerjee, M. Batzill, D. E. Beck, and B. E. Koel, *Surface Sci.*, **603**, 1161-1167 (2009).

230. "Investigation of CO oxidation transient kinetics on an oxygen pre-covered Au(211) stepped surface", J. Kim, E. Samano, and B. E. Koel, *Catal. Lett.*, **128**, 263-267 (2009).

229. "An IRAS study of CO bonding on Sn/Pt(111) surface alloys at maximal pressures of 10 Torr", A. Hightower, M. D. Perez, and B. E. Koel", *Surface Sci.,* **603**, 455-461 (2009).

228. "A Study of Iodine Adlayers on Polycrystalline Gold Electrodes by in-situ Electrochemical Rutherford Backscattering (ECRBS)", A. Hightower, B. E. Koel, and T. Felter, *Electrochimica Acta*, **54**, 1777-1783 (2009).

2008

227. "Real-time scanning tunneling microscopy observations of the oxidation of a Ti/Pt(111)-(2×2) surface alloy using O_2 and NO_2", S. Hsieh, G. F. Liu, and B. E. Koel, *J. Vac. Sci. Technol.*, A **26**, 1336-1342 (2008).

226. "Determination of the Oxide Layer Thickness in Core-Shell Zero-Valent Iron Nanoparticles", J. Martin, A. Herzing, W. Yan, X. Li, B. Koel, C. Kiely, and W. Zhang, *Langmuir*, **24**, 4329-4334 (2008).

225. Chapter 5.3.4 "Promoters and Poisons", B. E. Koel and J. Kim, in *Handbook of Heterogeneous Catalysis*, 2nd Edition, G. Ertl, H. Knözinger, F. Schüth, and J. Weitkamp (Eds.), (VCH, Weinheim, Germany, 2008), pp. 1593-1624.

224. "VOXELS: Volume Enclosing Microstructures", R. Gagler, A. Bugacov, B. E. Koel and P. Will, *J. Micromech. Microeng.*, **18,** 055025-30, (2008).

2007

223. "Oxidation of Au on vicinal W(110): Role of step edges and facets", A. Varykhalov, O. Rader, V. K. Adamchuk, W. Gudat, B. E. Koel and A. M. Shikin, *Phys. Rev. B*, **75**, 205417-1-8 (2007).

222. "Investigation of the Thermal Stability of 2-D Patterns of Au Nanoparticles", T.-Y. Shih, A. A. G. Requicha, M. E. Thompson, and B. E. Koel, *J. Nanosci. Nanotechnol.*, **7**, 2863-2869 (2007).

2006

221. "Investigation of ruthenium dissolution in advanced membrane electrode assemblies for direct methanol based fuel cell stacks," T. I. Valdez, S. Firdosy, B. E. Koel, and S. R.

Narayanan, *ECS Transactions*, **1**(6, *Proton Exchange Membrane Fuel Cells V, in Honor of Supramaniam Srinivasan*), 293-303 (2006).

220. "Oxygen adsorption and oxidation reactions on Au(211) surfaces: Exposures using O_2 at high pressures and ozone (O_3) in UHV", J. Kim, E. Samano, and B. E. Koel, *Surface Sci.*, **600**, 4622-4632 (2006).

219. "CO Adsorption and Reaction on Clean and Oxygen-Covered Au(211) Surfaces", J. Kim, E. Samano and B. E. Koel, *J. Phys. Chem. B*, **110**, 17512-17517 (2006).

218. Chapter 3.8.4 "Adsorbed CO_2, NO_2, O_3, SO_2, OCS, and N_2O on Metals", C. Panja, J. Kim, E. C. Samano, and B. E. Koel, in *Adsorbed Layers on Surfaces*, Landolt-Bornstein Volume III/42, H. Bonzel (Ed.), (Springer-Verlag, Berlin-Heidelberg, 2006), pp. 170-241.

217. "Catalytic oxidation of HCN over a 0.5% Pt/Al_2O_3 catalyst", H. Zhao, R. G. Tonkyn, S. E. Barlow, B. E. Koel, and C. H. F. Peden, *Applied Catalysis B: Environmental*, **65,** 282-290 (2006).

216. "Fractional factorial study of HCN removal over a 0.5% Pt/Al_2O_3 catalyst: Effects of temperature, gas flow rate, and reactant partial pressure", H. Zhao, R. G. Tonkyn, S. E. Barlow, C. H. F. Peden, and B. E. Koel, *Ind. Eng. Chem. Res.,* **45**, 934-939 (2006).

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