Bingjun Xu

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EDUCATION

Harvard University *Cambridge, MA, USA*

- Ph.D. Physical Chemistry (Adviser: Prof. Cynthia M. Friend) *2007 – 2011*

  Thesis: Fundamental Concepts in Catalytic Oxidative-Coupling Reactions on Metallic Gold

Fudan University *Shanghai, P.R. China*

- M.S. Physical Chemistry (Adviser: Prof. Zi Gao) *2004 - 2007*
- B.S. Chemistry *2000 - 2004*

PROFESSIONAL EXPERIENCE

Ge Li and Ning Zhao Chair Professor, College of Chemistry & Molecular Engineering, Peking University *2020 – Present*

Centennial Development Associate Professor of Chemical & Biomolecular Engineering, Department of Chemical & Biomolecular Engineering, University of Delaware *2019 – 2020*

Assistant Professor, Department of Chemical & Biomolecular Engineering, University of Delaware *2013 – 2019*

Thrust Leader, Catalysis Center for Energy Innovation, University of Delaware *2014 – 2018*

Postdoctoral Fellow, California Institute of Technology (Adviser: Prof. Mark E. Davis) *2011 – 2013*

HONORS & AWARDS

I&EC 2018 Class of Influential Researchers *2018*
National Science Foundation CAREER Award *2017*
Air Force Office of Scientific Research Young Investigator Award *2016*
ACS Petroleum Research Fund Doctoral New Investigator Award *2015*
University of Delaware Research Foundation Award *2015*
National Graduate Research Award of American Vacuum Society *2011*
Fieser Lectureship of Department of Chemistry and Chemical Biology, Harvard University *2011*
Chinese Government Award for Outstanding Students Abroad *2011*
Harvard Graduate Consortium on Energy and Environment Fellowship *2008*
Distinguished Master's Thesis Award *2008*
Honeywell Scholarship *2006*
Distinguished Graduate of Shanghai *2004*
Unilever Scholarship *2003*

PROFESSIONAL MEMBERSHIPS

American Institute of Chemical Engineers *2012 - Present*
American Chemical Society *2008 - Present*
North American Catalysis Society *2011 - Present*
Catalysis Club of Philadelphia *2013 - 2020*
Northeast Corridor Zeolite Association *2016 - 2020*

PROFESSIONAL SERVICE

Associate Editor, Science Advances *2020 – Present*
Associate Editor, Acta Physico-Chimica Sinica *2020 – Present*
Editorial Board Member, Nature Scientific Reports *2016 – Present*

Program Chair, Northeast Corridor Zeolite Association *2016 – 2019*
Early Career Editorial Advisory Board, ACS Catalysis *2017 – 2018*
Director, Catalysis Club of Philadelphia *2014 – 2016*

PUBLICATIONS (*: Corresponding author, *Italicized: Undergraduate coauthor*)

1. C. Li, H. Xiong, M. He, B. Xu*, Q. Lu*, "Oxyhydroxide Species Enhances CO_2 Electroreduction to CO on Ag via Co-electrolysis with O_2", *ACS Catal.*, 11, **2021**, Accepted.
2. X. Chang, H. Xiong, Y. Xu, Y. Zhao, Q. Lu*, B. Xu*, "Determining Intrinsic Stark Tuning Rates of Adsorbed CO on Copper Surfaces", *Catal. Sci. Tech.*, 11, **2021**, Accepted.
3. Y. Yuan, C. Brady, R. Lobo, B. Xu*, "Understanding the Correlation between Ga Speciation and Propane Dehydrogenation Activity on Ga/H-ZSM-5 Catalysts" *ACS Catal.*, 11, **2021**, 10647.
4. J. Li, X. Chang, H. Zhang, A. Malkani, M. Cheng, B. Xu*, Q. Lu*, "Electrokinetic and in situ spectroscopic investigations of CO electrochemical reduction on copper", *Nat. Commun.*, 12, **2021**, 3264.
5. Y. Yuan, C. Brady, L. Annamalai, R. Lobo, B. Xu*, "Ga Speciation in Ga/H-ZSM-5 by In-Situ Transmission FTIR Spectroscopy", *J. Catal.*, 393, **2021**, 60.
6. B. Hasa, M. Jouny, B. Ko, B. Xu*, F. Jiao*. "Flow Electrolyzer Mass Spectrometry with a Gas Diffusion Electrode Design", *Angew. Chem. Int. Ed.*, 60, **2021**, 3277-3282.
7. C. Brady, Q. Debruyne, A. Majumder, B. Goodfellow, R. Lobo, B. Xu*, "An Integrated Methane Dehydroaromatization and Chemical Looping Process ", *Chem. Eng. J.*, 406, **2021**, 127168.
8. X. Chang, Y. Zhao, B. Xu*, "pH-Dependence of Cu Surface Speciation in the Electrochemical CO Reduction Reaction", *ACS Catal.*, 10, **2020**, 13737.
9. A. Malkani, J. Anibal, X. Chang, B. Xu*, "Bridging the Gap in the Mechanistic Understanding of Electrocatalysis via In-Situ Characterizations", *iScience*, 23, **2020**, 101776.
10. C. Brady, J. Pan, B. Xu*, "Sulfur Resilient Nickel based Catalysts for Steam Reforming of Jet Fuel", *Catal. Sci. Tech.*, 10, **2020**, 8429.
11. A. Malkani, J. Anibal, B. Xu*, "Cation Effect on Interfacial CO_2 Concentration in the Electrochemical CO_2 Reduction Reaction", *ACS Catal.*, 10, **2020**, 14871.
12. A. Malkani, J. Li, N. Oliveira, M. He, X. Chang, B. Xu*, Q. Lu*, "Understanding the Electric and Non-Electric Field Components of the Cation Effect on the Electrochemical CO Reduction Reaction", *Sci. Adv.*, 6, **2020**, eabd2569.
13. J. Anibal, B. Xu*, "Electroreductive C-C Coupling of Furfural and Benzaldehyde on Cu and Pb Surfaces", *ACS Catal.*, 10, **2020**, 11643.
14. H. Cho, B. Xu*, "Enabling Selective Tandem Reactions via Catalyst Architecture Engineering", *Trends Chem.*, 2, **2020**, 929.
15. M. He, C. Li, H. Zhang, X. Chang, J. Chen, W. Goddard, M. Cheng*, B. Xu*, Q. Lu*, "Oxygen Induced Promotion of Electrochemical Reduction of CO_2 via Co-Electrolysis", *Nat. Commun.*, 11, **2020**, 3844.
16. H. Cho, D. Kim, B. Xu*, "Pore Size Engineering Enabled Selectivity Control in Tandem Catalytic Upgrading of Cyclopentanone on Zeolite Encapsulated Pt Nanoparticles", *ACS Catal.*, 10, **2020**, 8850.
17. Y. Li, S. Intikhab, A. Malkani, B. Xu, J. Snyder*, "Ionic Liquid Additives for the Mitigation of Nafion Specific Adsorption on Platinum", *ACS Catal.*, 10, **2020**, 7691.
18. Y. Zhao, X. Chang, A. Malkani, X. Yang, L. Thompson*, F. Jiao*, B. Xu*, "Speciation of Cu Surfaces During the Electrochemical CO Reduction Reaction", *J. Am. Chem. Soc.*, 142, **2020**, 9735 (**Cover Story**).
19. C. Yang, B. Ko, S. Hwang, Z. Liu, Y. Yao, W. Luc, M. Cui, A. Malkani, T. Li, X. Wang, J. Dai, B. Xu, G. Wang, D. Su, F. Jiao*, L. Hu*, "Overcoming Immiscibility Toward Bimetallic Catalyst Library" *Sci. Adv.*, 6, **2020**, eaaz6844
20. J. Anibal, A. Malkani, B. Xu*, "Stability of the Ketyl Radical as a Descriptor in the Electrochemical Coupling of Benzaldehyde", *Catal. Sci. Tech.*, 10, **2020**, 3181 (**Cover Story**).
21. H. Cho, D. Kim, B. Xu*, "Selectivity Control in Tandem Catalytic Furfural Upgrading on Zeolite-Encapsulated Pt Nanoparticles through Site and Solvent Engineering", *ACS Catal.*, 10, **2020**, 4770.
22. X. Chang, A. Malkani, X. Yang, B. Xu*, "Mechanistic Insights into Electroreductive C-C Coupling between CO and Acetaldehyde into Multi-Carbon Products", *J. Am. Chem. Soc.*, 142, **2020**, 2975.

23. N. Gould, S. Li, H. Cho, *H. Landfield*, S. Caratzoulas, D. Vlachos, P. Bai*, B. Xu*, "Understanding Solvent Effects on Adsorption and Protonation in Porous Catalysts", *Nat. Commun.*, 11, **2020**, 1060.
24. H. Cho, D. Kim, S. Li, D. Su, D. Ma, B. Xu*, "Molecular-Level Proximity of Metal and Acid Sites in Zeolite-Encapsulated Pt Nanoparticles for Selective Multistep Tandem Catalysis", *ACS Catal.*, 10, **2020**, 3340.
25. M. Gilkey, H. Cho, B. Murphy, J. Wu, D. Vlachos, B. Xu*, "Catalytic Adipic Acid Production on Zeolites from Biomass-Derived Tetrahydrofuran-2,5-Dicarboxylic Acid", *ACS Appl. Energy Mater.*, 3, **2020**, 99.
26. A. Malkani, J. Li, J. Anibal, Q. Lu*, B. Xu*, "Impact of Forced Convection on Spectroscopic Observations of the Electrochemical CO Reduction Reaction", *ACS Catal.*,10, **2020**, 941.
27. S. Li, J. Liu, Z. Yin, P. Ren, L. Lin, Y. Gong, C. Yang, X. Zheng, R. Cao, S. Yao, Y. Deng, X. Liu, L. Gu, W. Zhou, J. Zhu, X. Wen, B. Xu, D. Ma*, "Impact of Coordination Environment on Atomically Dispersed Pt Catalyst for Oxygen Reduction Reaction", *ACS Catal.*, 10, **2020**, 907.
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29. J. Li, D. Wu, A. Malkani, M. Cheng, B. Xu*, Q. Lu*, "Hydroxide Is Not A Promoter of C_2 Product Formation in Electrochemical Reduction of CO2 on Copper", *Angew. Chem. Int. Ed.*, 132, **2020**, 4494 (**Cover Story**).
30. C. Brady, M. Davis*, B. Xu*, "Integration of Thermochemical Water Splitting with CO_2 Direct Air Capture", *Proc. Natl. Acad. Sci.*, 116, **2019**, 25001.
31. M. Zhang, M. Wang, B. Xu*, D. Ma*, "How to Measure the reaction Performance of Heterogeneous Catalytic Reactions Reliably", *Joule*, 3, **2019**, 2876.
32. X. Yang, J. Nash, N. Oliveira, Y. Yan*, and B. Xu*, "Understanding the pH Dependence of Underpotential Deposited Hydrogen on Platinum", *Angew. Chem. Int. Ed.*, **2019**, 58, 17718 (**Cover Story**).
33. X. Yang, S. Kattel, J. Nash, X. Chang, J. Lee, Y. Yan*, J. Chen* and B. Xu*, "Quantification of Active Sites and Elucidation of Reaction Mechanism of Electrochemical Nitrogen Reduction Reaction on Vanadium Nitride", *Angew. Chem. In. Ed.*, 131, **2019**, 13906. **(Cover Story)**
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35. F. Jiao*, B. Xu*, "Electrochemical Ammonia Synthesis and Ammonia Fuel Cells", *Adv. Mater.*, 31, **2019**, 1805173. **(Invited Perspective, Cover Story)**
36. Y. Zhao, B. Setzler, J. Wang, J. Nash, B. Xu and Y. Yan*, "An Efficient Direct Ammonia Fuel Cell for Affordable Carbon-Neutral Transportation", *Joule*, 10, **2019**, 2472.
37. H. Zhang, X. Chang, J. Chen, W. Goddard III, B. Xu*, M Cheng* and Q. Lu*, "Computational and experimental demonstrations of one-pot tandem catalysis for electrochemical carbon dioxide reduction to methane", *Nat. Commun.*, 10, **2019**, 3310.
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40. J. Jiao, R. Lin, S. Liu, W. Cheong, C. Zhang, Z. Chen, Y. Pan, K. Wu, S. Hung, H. Chen, L. Zheng, Q. Lu, X. Yang, B. Xu, H. Xiao*, J. Li, D. Wang, Q. Peng, C. Chen*, Y. Li, "Cu Atom-Pair Catalyst Anchored on Ally Nanowires for Selective and Efficient Electrochemical Reduction of CO_2", *Nat. Chem.*, 11, **2019**, 222.
41. B. Murphy, J. Wu, H. Cho, *J. Soreo*, C. Wang, L. Ma, B. Xu*, "Nature and Catalytic Properties of In Situ Generated Brønsted Acid Sites on NaY", *ACS Catal.*, 9, **2019**, 1931. **(Cover Story)**
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43. A. Malkani, M. Dunwell, B. Xu*, "Operando Spectroscopic Investigations of Copper and Oxide Derived Copper Catalysts for Electrochemical CO Reduction", *ACS Catal.*, 9, **2019**, 474.
44. J. Nash, J. Zheng, Y. Wang, B. Xu*, Y. Yan*, "Mechanistic Study of the Hydrogen Oxidation/Evolution reaction over Bimetallic PtRu Catalysts in Alkaline Electrolytes", *J. Electrochem. Soc.*, 165, **2018**, J3378.

45. H. Cho, D. Kim, J. Li, D. Su, B. Xu*, "Zeolite Encapsulated Pt Nanoparticles for Tandem Catalysis", *J. Am. Chem. Soc.*, 140, **2018**, 13514.
46. X. Yang, J. Nash, J. Anibal, M. Dunwell, S. Kattel, E. Stavitski, K. Attenkofer, J. Chen*, Y. Yan*, B. Xu*, "Mechanistic Insights into Electrochemical Nitrogen Reduction Reaction on Vanadium Nitride Nanoparticles", *J. Am. Chem. Soc.*, 140, **2018**, 13387.
47. S. Giles, J. Wilson, J. Nash, J. Zheng, B. Xu, D. Vlachos*, Y. Yan*, "Recent Advances in Understanding the pH Dependence of the Hydrogen Oxidation and Evolution Reactions", *J. Catal.*, 367, **2018**, 328.
48. M. Dunwell, X. Yang, Y. Yan*, B. Xu*, "Potential Routes and Mitigation Strategies of Contamination in Interfacial Specific Infrared Spectroelectrochemical Studies", *J. Phys. Chem. C*, 122, **2018**, 24658. **(Cover Story)**
49. B. Murphy, T. Mou, B. Wang, B. Xu*, "Effect of Co-Fed Species on the Kinetics of Catalytic Methyl Lactate Dehydration on NaY", *ACS Catal.*, 8, **2018**, 9066.
50. N. Gould, B. Xu*, "Temperature Programmed Desorption of Pyridine on Zeolites in the Presence of Liquid Solvents", *ACS Catal.*, 8, **2018**, 8699.
51. M. Dunwell, W. Luc, Y. Yan*, F. Jiao*, B. Xu*, "Understanding Surface-Mediated Electrochemical Reactions: 2-Electron CO2 Reduction and Beyond", *ACS Catal.*, 8, **2018**, 8121. **(Invited Perspective)**
52. M. Dunwell, Y. Yan*, B. Xu*, "Understanding the Influence of the Electrical Double-Layer on Heterogeneous Electrochemical Reactions", *Curr. Opin. Chem. Eng.*, 20, **2018**, 151. **(Invited Review)**
53. M. Gilkey, *R. Balakumar*, D. Vlachos*, B. Xu*, "Adipic Acid Production Catalyzed by a Combination of a Solid Acid and an Iodide Salt from Biomass-Derived Tetrahydrofuran-2,5-dicarboxylic Acid", *Catal. Sci. Tech.*, 57, **2018**, 5591.
54. M. Dunwell, X. Yang, B. Setzler, J. Anibal, Y. Yan*, B. Xu*, "Examination of Near-Electrode Concentration Gradients and Kinetic Impacts on the Electrochemical Reduction of CO2 using Surface Enhanced Infrared Spectroscopy", *ACS Catal.*, 8, **2018**, 3999.
55. M. Gilkey, C. Brady, D. Vlachos, B. Xu*, "Characterization of Oxidation States in Metal/Metal Oxide Catalysts in Liquid-Phase Hydrodeoxygenation Reactions with a Trickle Bed Reactor", *Ind. Eng. Chem. Res.*, 57, **2018**, 5591. **(Cover story)**
56. B. Murphy, B. Xu*, "Foundational Techniques for Catalyst Design in the Upgrading of Biomass-Derived Multifunctional Molecules", *Prog. Energy Combust. Sci.*, 67, **2018**, 1. **(Invited Review)**
57. J. Zheng, J. Nash, B. Xu, Y. Yan*, "Towards establishing apparent hydrogen binding energy as the descriptor for hydrogen oxidation/evolution reactions", *J. Electrochem. Soc.*, 105, **2018**, H27.
58. N. Gould, B. Xu*, "Catalyst Characterization in the Presence of Solvent: Development of Liquid Phase Structure-Activity Relationships", *Chem. Sci.*, 9, **2018**, 281. **(Invited Review)**
59. N. Gould, B. Xu*, "Quantification of Acid Site Densities on Zeolites in the Presence of Solvents via Determination of Extinction Coefficients of Adsorbed Pyridine", *J. Catal.*, 358, **2018**, 80.
60. A. Mehdad, N. Gould, B. Xu, R. Lobo*, "Effect of Steam and CO_2 on Ethane Activation over Zn-ZSM-5", *Catal. Sci. Tech.*, 8, **2018**, 358.
61. M. Gilkey, A. Mironenko, D. Vlachos*, B. Xu*, "Adipic Acid Production via Metal-Free Selective Hydrogenolysis of Biomass-Derived Tetrahydrofuran-2,5-dicarboxylic acid", *ACS Catal.*, 7, **2017**, 6619. **(Cover story)**
62. J. Nash, X. Yang, J. Anibal, J. Wang, Y. Yan*, B. Xu*, "Electrochemical Nitrogen Reduction Reaction on Noble Metal Catalysts in Proton and Hydroxide Exchange Membrane Electrolyzers", *J. Electrochem. Soc.*, 164, **2017**, F1712.
63. M. Dunwell, Y. Yan*, B. Xu*, "In-Situ Infrared Spectroscopic Investigations of Pyridine-Mediated CO_2 Reduction on Pt Electrocatalysts", *ACS Catal.*, 7, **2017**, 5410.
64. M. Gilkey, D. Vlachos*, B. Xu*, "Poisoning of Ru/C by Homogeneous Brønsted Acids in Hydrodeoxygenation of 2,5-Dimethylfuran via Catalytic Transfer Hydrogenation", *Appl. Catal. A*, 542, **2017**, 327.
65. S. Liu, S. Dutta, W. Zheng, N. Gould, Z. Cheng, B. Xu, D. Vlachos*, B. Saha*, "Catalytic Hydrodeoxygenation of High Carbon Furylmethanes to Renewable Jet-fuel Ranged Alkanes over a Rhenium Modified Iridium Catalyst", *ChemSusChem*, 10, **2017**, 3225. **(Cover story)**

66. C. Brady, B. Murphy, B. Xu*, "Enhanced Methane Dehydroaromatization via Coupling with Chemical Looping", *ACS Catal.*, 7, **2017**, 3924.
67. C. Friend*, B. Xu*, "Heterogeneous Catalysis – A Central Science for a Sustainable Future", *Acc. Chem. Res.*, 50, **2017**, 517. **(Invited Perspective)**
68. M. Dunwell, Q. Lu, J. Heyes, J. Rosen, J. Chen, Y. Yan*, F. Jiao*, B. Xu*, "The Central Role of Bicarbonate in the Electrochemical Reduction of CO_2 on Gold", *J. Am. Chem. Soc.*, 139, **2017**, 3774.
69. B. Murphy, *M. Letterio*, B. Xu*, "Catalyst Deactivation in Pyridine-Assisted Selective Dehydration of Methyl Lactate on NaY", *ACS Catal.*, 7, **2017**, 1912.
70. H. Cho, L. Ren, V. Vattipailli, Y. Yeh, N. Gould, B. Xu, R. Gorte, R. Lobo, P. Dauenhauer, M. Tsapatsis, W. Fan*, "Renewable p-Xylene from 2,5-Dimethylfuran and Ethylene Using Phosphorus-containing Zeolite Catalysts", *ChemCatChem*, 9, **2017**, 398.
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72. M. Gilkey, A. Mironenko, *L. Yang, D.* Vlachos*, B. Xu*, "Insights into Ring Opening of Biomass-Derived Furanics over Ru/C", *ChemSusChem*, 9, **2016**, 3113.
73. N. Gould, B. Xu*, "Effect of Liquid Water on Acid Sites of NaY: An in-situ Liquid Phase Spectroscopic Study", *J. Catal.,* 342, **2016**, 193.
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80. M. Gilkey, B. Xu*, "Heterogeneous Catalytic Transfer Hydrogenation as an Effective Pathway in Biomass Upgrading", *ACS Catal.,* 6, **2016**, 1420. **(Invited Review)**
81. M. Dunwell, Y. Yan*, B. Xu*, "A Surface-Enhanced Infrared Absorption Spectroscopic Study of pH Dependent Water Adsorption on Au", *Surf. Sci.*, 650, **2015**, 51.
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88. S. Gu, B. Xu, Y. Yan*, "Electrochemical Energy Engineering: A New Frontier of Chemical Engineering Innovation", *Annu. Rev. Chem. Biomol. Eng.*, 5, **2014**, 429. **(Invited Review)**

Graduate and Postdoctoral Work

89. B. Xu, C. Siler, R. Madix, C. Friend, "Predicting Gold-Mediated Catalytic Oxidative-Coupling Reactions from Single Crystal Studies", *Acc. Chem. Res.*, 47, **2014**, 761.
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