

Elaine Gomez

eg2768@columbia.edu

Education

Columbia University, New York City, NY

2014-(May 2019)

Ph.D. Candidate, Chemical Engineering

National Science Foundation Graduate Research Fellow

Master of Philosophy in Chemical Engineering

(May 2018)

Relevant Coursework:

- *Closing the Carbon Cycle*
- *Carbon Sequestration*
- *Planning Urban Energy Systems (and Climate Change)*
- *Catalysis for Emission Control*

Master of Science in Chemical Engineering

May 2016

Relevant Coursework:

- *Advanced Synchrotron Materials Characterization*
- *Surface Reactions and Adv. Kinetics*
- *Industrial Catalysis*
- *Adv. Math Methods in Chemical Engineering*

New Jersey Institute of Technology, Newark, NJ

2010-2014

Albert Dorman Honors College

Bachelor of Science, *summa cum laude*, Chemical Engineering

Research Experience

Columbia University, New York City, NY

2014-Present

Ph.D. Candidate, Advisor: Dr. Jingguang G. Chen, Heterogeneous Catalysis

Research Lead on Flow Reactor and Kinetics, Laboratory Manager, and Safety Lead

- Investigating promising bimetallic catalysts for the reduction of CO₂ via reforming and oxidative dehydrogenation of light alkanes
- Responsible for high impact in situ synchrotron characterization proposals and experiments for the Chen research group at the Stanford Synchrotron Radiation Lightsource (SSRL) and the Advanced Photon Light Source (APS)
- Initial point of contact for incoming graduate students so that they may efficiently train on equipment, learn techniques, and successfully complete their preliminary research plan

Chemtura Corporation, Fords, NJ

Summer 2013

Research and Development Intern, Technical Manager: Dale Carr

- Blended and synthesized custom esters for lubricant base stocks from raw materials
- Responsible for planning experiments, data collection, and analysis for an air entrainment investigation for the U.S. Navy
- Actively participated in safety meetings to assess near-misses and discuss incident prevention strategies

Center for Natural Resources Development and Protection, Newark, NJ

2012-2013

Research Aide, Director: Dr. Michel Boufadel

- Assisted Langan Engineering and Environmental Services Inc. with bench scale soil experiments
- Determined nutrient concentrations (Auto Analyzer 3), rate of oxygen consumption, and oil degradation of samples

National Renewable Energy Laboratory, Golden, CO

Summer 2012

Catalyst Characterization Intern, Mentor: Dr. Matthew Yung

- Synthesized and characterized catalysts for vapor phase catalytic deoxygenation of model pyrolysis compounds
- Conducted reaction experiments, monitored reaction pathways, and compiled findings

Undergraduate Research, Mentor: Dr. Robert B. Barat

- Completed construction of an effective continuous ammonia-based carbon dioxide scrubbing system operating under optimal process parameters
- Coordinated the addition of the scrubbing system to the unit operations undergraduate course

Publications

E. Gomez, S. Kattel, B. Yan, S. Yao, P. Liu, and J.G. Chen, "Combining CO₂ Reduction with Propane Oxidative Dehydrogenation over Bimetallic Catalysts", *Nat. Commun.*, (2018) accepted. DOI: 10.1038/s41467-018-03793-w

L. Winter, E. Gomez, B. Yan, S. Yao, and J.G. Chen, "Tuning Ni-catalyzed CO₂ hydrogenation selectivity via Ni-ceria support interactions and Ni-Fe bimetallic formation", *Applied Catal. B Environ.*, 224 (2018) 442. DOI: 10.1016/j.apcatb.2017.10.036

B. Yan, X. Yang, S. Yao, J. Wan, M. Myint, E. Gomez, Z. Xie, S. Kattel, W. Xu, and J.G. Chen, "Dry Reforming of Ethane and Butane with CO₂ over PtNi/CeO₂ Bimetallic Catalysts", *ACS Catal.*, 6 (2016) 7283. DOI: 10.1021/acscatal.6b02176

M.D. Porosoff, M. Myint, S. Kattel, Z. Xie, E. Gomez, P. Liu, and J.G. Chen, "Identifying Different Types of Catalysts for CO₂ Reduction by Ethane through Dry Reforming and Oxidative Dehydrogenation" *Angw. Chem. Int. Ed.*, 54 (2015) 15501. DOI: 10.1002/anie.201508128

E. Gomez, M. Paul, C. Como, and R.B. Barat, "A "Greenhouse Gas" Experiment for the Undergraduate Laboratory." *Chem. Eng. Educ.*, 48 (2014) 107.

Pending Work and Conference Papers:

E. Gomez and J.G. Chen, (*to be submitted as an Invited Paper for the AIChE Journal "Best Paper"*) "Identifying promising bimetallic catalysts for propane dry reforming and oxidative dehydrogenation by CO₂"

E. Gomez and J.G. Chen, (*in preparation for Journal of CO₂ Utilization*) "The role of oxide supports on the CO₂ oxidative dehydrogenation and dry reforming of propane"

E. Gomez, B. Tackett, and J.G. Chen, (*in preparation*) "Perspectives on CO₂ Catalysis: CO₂ mole balance for methanol synthesis via hybrid electro- and thermo- catalysis"

X. Li, B. Yan, S. Yao, E. Gomez, J.G. Chen, and T. Wang, (*in preparation*) "Combining Ethane Aromatization with CO₂ Reduction over Iron-Modified Zeolites"

M. Yung, Gomez, E. and J.N. Kuhn, "Vapor Phase Catalytic Upgrading of Model Biomass-Derived Oxygenate Compounds" paper presented to the AIChE Annual Meeting, Pittsburgh, PA, (2012).

Selected Oral Presentations

- "Combining CO₂ reduction with propane oxidative dehydrogenation over bimetallic catalysts"
 - **Invited Talk**, The Catalysis Society of Metropolitan New York, Somerset, NJ, May 2017
 - **Awarded Best Presentation of Session**, AIChE Annual Meeting, Catalysis for C1 Chemistry: CO₂ Conversion and Methane Reforming, Minneapolis, MN, November 2017
- "Identifying promising bimetallic catalysts for oxidative dehydrogenation and dry reforming of propane by CO₂"
 - **NAM25**, North American Catalysis Society Meeting, Denver, CO, June 2017

Selected Poster Presentations

- "Combining CO₂ reduction with propane oxidative dehydrogenation over bimetallic catalysts", **2nd Place**: Catalysis Society of Metropolitan New York, Annandale, NJ, March 2017

Selected Poster Presentations *cont.*

- “Catalytic Reduction of CO₂ via Propane Dry Reforming and Oxidative Dehydrogenation”, **Outstanding Graduate Student Poster**, Gordon Conference for Catalysis, New Long, NH, June 2016.
- “Vapor Phase Catalytic Deoxygenation of Model Pyrolysis Compounds”
 - **1st Place**: Energy and Petroleum Category: AIChE National Meeting, Pittsburgh, PA, October 2012.
 - **2nd Place**: Colorado Center for Bio-refining and Biofuels Poster Session, Boulder, CO, August 2012.

Fellowships and Selected Awards

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| • National Science Foundation Graduate Research Fellowship | 2014-Present |
| • Gates Millennium Scholar (<i>Undergraduate and Graduate Fellowship</i>) | 2010-Present |
| • Columbia University Chemical Engineering Department Pesco Award | 2014-Present |
| • Columbia University Provost’s Diversity Fellowship | 2014-Present |
| • Columbia University Grossman Scholar | 2014-Present |
| • NJIT Research “Top Three Pioneering Women in Chemical Engineering through the decades” | 2017 |
| • Gordon Conference for Catalysis Diversity in Research Award | 2016 |
| • NJIT Madame Mau Outstanding Female Engineering Award | 2014 |
| • Barry M. Goldwater Honorable Mention for Excellence in Undergraduate Research | 2013 |
| • The Society of Chemical Industry (SCI) Scholar | 2013 |
| • Albert Dorman Honors College Metz Scholarship | 2010-2014 |
| • NJIT Board of Trustees Scholarship | 2013-2014 |

Interests

• Catalytic conversion of CO₂ with precious and non-precious metal supported catalysts • In situ synchrotron techniques to investigate structural and electronic properties • Aromatization of light alkanes with zeolites • Carbon management via life cycle analysis of thermocatalytic processes involving CO₂ as a reactant (closing the carbon cycle) • Carbon capture and utilization (dual functional materials and Direct Air Capture techniques) • Biomass conversion and vapor phase upgrading

Selected Technical Skills

Experienced with:

- Flow and batch reactor set-ups for heterogeneous catalysis applications equipped with Gas Chromatograph and or Mass Spectrometer (GC & GC/MS)
 - Design and construction of lab-scale flow reactors
 - Reactor data analysis: steady-state activity, selectivity, and stability as well as kinetic analysis of activation barriers, reaction orders, and rate constants
- Material synthesis: supported bimetallic catalysts and carbides
 - Incipient wetness impregnation and slurry method
- Catalysis synchrotron beamline techniques:
 - X-ray absorption near edge structure (XANES)
 - Extended X-ray absorption fine structure (EXAFS)
- Transmission Scanning Electron Microscope (TEM/S)
 - Energy Dispersive Spectroscopy (TEM/EDS)

Selected Technical Skills (cont.)

- Catalyst characterization instruments:
 - Temperature programmed reduction/oxidation (TPR/TPO)
 - Thermogravimetric analysis (TGA)
 - Pulse Chemisorption
- Miscellaneous: Gas Analyzers and Auto Analyzer 3
- Software: HSC Chemistry, Athena, ASPEN Plus, IGOR, MATLAB

Community Outreach and Broader Research Impacts

Columbia University, New York City, NY

2014-Present

Research Mentor: High school, undergraduate, and master students

- Prepare effective individualized research plans for various skill levels such that each student may complete laboratory tasks independently to enable confidence and genuine interest in scientific discovery

Fellowship Application Reviewer

- Aid graduate students in a recurring workshop series to simultaneously convey scientific knowledge and personal enthusiasm in research proposals to secure fellowship funding

Union City High School, Union City, NJ

2010-Present

College Speaker and Mentor

- Lead the judging committee at the annual Hudson County Science Fair to award gold, silver, and bronze medals to high school students
- Coordinate information sessions with local high school teacher to provide information and assistance with college, FAFSA, and scholarship applications
- Established a one-on-one network for college-bound students with fellow Union City High School graduates that are currently pursuing or have a degree in a STEM field