

CURRICULUM VITAE

KEEMA ABAD

keemia.abad@uky.edu

EDUCATION

University of Kentucky

PhD Candidate in Chemistry

2020-Present

Areas of concentration: Analytical and Environmental Chemistry

Rutgers, the State University of New Jersey

Bachelor of Arts in Genetics

2015

RESEARCH EXPERIENCE

University of Kentucky

Institute for Decarbonization and Energy Advancement

2024 – Present

Research Scientist Senior

2024 – Present

Center for Applied Energy Research

2015 – 2024

Research Scientist Senior

2022-2024

Research Scientist Associate

2017-2022

Research Scientist Assistant

2016-2017

Lab Technician

2015-2016

- Performed gas phase sample collection and analysis tests following EPA methods and in house procedures from a bench and pilot scale amine based CO₂ capture plant to monitor chemical emissions as part of a Department of Energy funded project
- Investigated the accumulation of environmental contaminants from lab, bench and pilot CO₂ capture systems. Contaminants include trace heavy metals, nitrosamines, oxidative and thermal degradation products
- Determined Henry's coefficient of nitrosamines and aldehydes to predict gas-phase partitioning and emissions of CO₂ capture systems
- Developed sample preparation and analysis methods of the ICP-MS analysis of Se, As and Fe from FGD waters to characterize and develop removal strategies
- Electrochemical decomposition of nitrosamines and aldehydes from wastewater
- Analysis of samples included method development, sample preparation, calibration, data integration, instrument QA/QC, and reporting the data.
- Instrumentation maintenance and operation including ICP-MS, IC, LC/MS-TOF, and GC-MS.

The Waksman Institute of Microbiology – Dr. Gallavotti Lab

Student Research Assistant

2013-2015

- Assisted in numerous lab techniques including DNA isolation, genotyping, PCR and gel electrophoresis
- Conducted independent research project building two constructs for maize transformation in which both proteins are expressed fused to a fluorescent protein. The constructs will help visualize the expression patterns of the encoded proteins. Techniques used included PCR, cloning and transformation of E. coli and Agrobacterium. Once introduced in Agrobacterium, the constructs were transformed into maize plants for further research.

PUBLICATIONS AND PAPERS

Kharel, P. L.; Gnanamani, M. K.; Hoque, M. A.; **Abad, K.**; Huang, N.; Gao, X.; Liu, K.; Omosebi, A. O.; Thompson, J. Copper-Doped Tin Oxides Supported on Mesoporous Carbon Xerogel for Boosting the Electrochemical Reduction of CO₂ to Formate in Bicarbonate Solution Coupled with CO₂. *Industrial & Engineering Chemistry Research* 2024, 63 (14), 6158-6168.

Hoque, M. A.; **Abad, K.**; Kharel, P.; Omosebi, A.; Thompson, J. Downstream Separation of Formic Acid with Anion-Exchange Resin from Electrocatalytic Carbon Dioxide (CO₂) Conversion: Adsorption, Kinetics, and Equilibrium Modeling. *Industrial & Engineering Chemistry Research* 2024, 63 (6), 2779-2790.

Abad, K.; Bhatnagar, S.; Jorgensen, T.; Sarma, M.; Liu, K.; Thompson, J. G., Removal of CO₂ Capture Solvent Contaminants and Degradation Products Using Activated Carbon. *Industrial & Engineering Chemistry Research* 2024, 63 (1), 498-507.

Toma, S.; Omosebi, A.; Gao, X.; **Abad, K.**; Bhatnagar, S.; Qian, D.; Liu, K.; Thompson, J. G. Targeted electrochemical reduction of carcinogenic N-nitrosamines from emission control systems within CO₂ capture plants. *Chemosphere* 2023, 333, 138915.

Xiao, M.; Sarma, M.; Nguyen, D.; Ruelas, S.; Yang, L.; Bhatnagar, S.; Jorgensen, T.; **Abad, K.**; Liu, K.; Thompson, J., Efficient carbon capture using sub-textured polymer packing surfaces via 3D printing. *Chemical Engineering Science* 2023, 267, 118320.

Moreno, D.; Omosebi, A.; Jeon, B. W.; **Abad, K.**; Kim, Y. H.; Thompson, J.; Liu, K., Electrochemical CO₂ conversion to formic acid using engineered enzymatic catalysts in a batch reactor. *Journal of CO₂ Utilization* 2023, 70, 102441.

Jorgensen, T. B.; **Abad, K.**; Sarma, M.; Guzman, M. I.; Thompson, J. G.; Liu, K., Research on oxygen solubility in aqueous amine solvents with common additives used for CO₂ chemical absorption. *International Journal of Greenhouse Gas Control* 2022, 116, 103646.

Thompson, J.; Matin, N.; Omosebi, A.; Moreno, D.; **Abad, K.**; Liu, K., Electrochemical CO₂ conversion to formic acid through the Andora Process. *SSRN Electronic Journal* 2022.

Jorgensen, T.; Thompson, J.; Sarma, M.; **Abad, K.**; Liu, K., Oxygen Solubility in Aqueous Amine Solvents with Common Additives Used for CO₂ Chemical Absorption. *SSRN Electronic Journal* 2022.

Sarma, M.; **Abad, K.**; Nguyen, D.; Ruelas, S.; Liu, K.; Thompson, J., Investigation of chemical stabilities and contact angle of 3D printed polymers with CO₂ capture solvents to enhance absorber performance. *International Journal of Greenhouse Gas Control* 2021, 111, 103478.

Moreno, D.; Omosebi, A.; **Abad, K.**; Jeon, B. W.; Landon, J.; Liu, K.; Kim, Y. H.; Thompson, J., Electrochemical Utilization of CO₂ From Coal Power Plants. *SSRN Electronic Journal* 2021.

Sarma, M.; **Abad, K.**; Bhatnagar, S.; Nguyen, D.; Ruelas, S.; Xiao, M.; Liu, K.; Thompson, J., Matching CO₂ Capture Solvents With 3D-Printed Polymeric Packing to Enhance Absorber Performance. *SSRN Electronic Journal* 2021.

Schuyler, T. J.; Irvin, B.; **Abad, K.**; Thompson, J. G.; Liu, K.; Guzman, M. I., Application of a Small Unmanned Aerial System to Measure Ammonia Emissions from a Pilot Amine-CO₂ Capture System. *Sensors* 2020, 20 (23).

Thompson, J. G.; Gao, X.; Toma, S.; **Abad, K.**; Bhatnagar, S.; Landon, J.; Liu, K., Decomposition of N-nitrosamines formed in CO₂ capture systems through electrochemically mediated reduction on carbon xerogel electrode. *International Journal of Greenhouse Gas Control* 2019, 83, 83-90.

Matin, N. S.; Thompson, J.; **Abad, K.**; Bhatnagar, S.; Liu, K., Thermal Degradation Rate and Kinetic Modeling of CO₂-Loaded Amine Solvent Blends of 2-Amino-2-methyl-1-propanol and 1-Amino-2-propanol. *Industrial & Engineering Chemistry Research* 2019, 59 (2), 685-692.

Thompson, J.; Gao, X.; Toma, S.; **Abad, K.**; Bhatnagar, S.; Landon, J.; Liu, K., Electrochemical Decomposition of Nitrosamines Formed in CO₂ Capture Systems. *SSRN Electronic Journal* 2019.

Thompson, J.; **Abad, K.**; Bhatnagar, S.; Ghorbanian, M.; Nikolic, H.; Liu, K., UKy-CAER Hybrid CO₂ Capture Technology: Pilot Testing of a Transformational Solvent System. *SSRN Electronic Journal* 2019.

Thompson, J. G.; Matin, N. S.; **Abad, K.**; Onneweer, F.; Bhatnagar, S.; Liu, K., Determining the Henry's volatility coefficient of nitrosamines in CO₂ capture solvents. *International Journal of Greenhouse Gas Control* 2018, 73, 104-110.

Thompson, J. G.; Combs, M.; **Abad, K.**; Bhatnagar, S.; Pelgen, J.; Beaudry, M.; Rochelle, G.; Hume, S.; Link, D.; Figueroa, J.; Nikolic, H.; Liu, K., Pilot testing of a heat integrated 0.7 MWe CO₂ capture system with two-stage air-stripping: Emission. *International Journal of Greenhouse Gas Control* 2017, 64, 267-275.

Thompson, J.; Nikolic, H.; Combs, M.; Bhatnagar, S.; Pelgen, J.; **Abad, K.**; Liu, K., Solvent Degradation and Emissions from a 0.7MWe Pilot CO₂ Capture System with Two-stage Stripping. *Energy Procedia* 2017, 114, 1297-1306.

Thompson, J. G.; Bhatnagar, S.; Combs, M.; **Abad, K.**; Onneweer, F.; Pelgen, J.; Link, D.; Figueroa, J.; Nikolic, H.; Liu, K., Pilot testing of a heat integrated 0.7 MWe CO₂ capture system with two-stage air-stripping: Amine degradation and metal accumulation. *International Journal of Greenhouse Gas Control* 2017, 64, 23-33.

ORAL PRESENTATIONS

Keemia Abad. Challenges with Aldehyde Analytical Methods from Aqueous Amine CO₂ Capture Solvents, University of Texas Conference on Carbon Capture and Storage (UTCCS-7), Hybrid conference hosted from the UT-Austin, January 23-25, 2024

Keemia Abad, Saloni Bhatnagar, Thomas Jorgensen, Moushumi Sarma, Kunlei Liu, Jesse Thompson. Removal of amine solvent contaminants using activated carbon in capture systems, PCCC-7, Pittsburgh, PA, September 25-27, 2023

Keemia Abad, Saloni Bhatnagar, Kunlei Liu, Jesse Thompson. Efficient decomposition of N-nitrosamines in waterwash solutions from CO₂ capture systems, PCCC-7, Pittsburgh, PA, September 25-27, 2023

Keemia Abad, Bradley Irvin, Thomas Jorgensen, Jesse Okorafor, Emmanuel Ohiomoba, Aercaptis, DOE's Office of Technology Transition EnergyTechUP, Appalachia + South Regional, Virtual, February 24, 2022

Keemia Abad. High efficiency decomposition of N-nitrosamines in waterwash solutions from CO₂ capture systems, University of Texas Conference on Carbon Capture and Storage (UTCCS-6), Virtual conference hosted from the UT-Austin, January 25-27, 2022

Keemia Abad, Shino Toma, Saloni Bhatnagar, Jesse Thompson, Kunlei Liu. High efficiency destruction of N-nitrosamines in waterwash solutions from CO₂ capture systems, PCCC-6, Virtual conference hosted from the UK, October 19-21, 2021

Keemia Abad. "Impact of Small Pilot Carbon Capture System Conditions on Emissions" Fourth University of Texas Conference on Carbon Capture and Storage (UTCCS-4) Austin, TX, 30-31 January 2018.

FUNDING SECURED

Co-I, "Targeted Pb Removal for Drinking Water Purification using INCION®", PHS 2018-02 Omnibus Solicitation of the NIH, CDC, and FDA for Small Business Innovation Research Grant Applications (Parent SBIR [R43/R44] to the National Institutes of Health, 24 months (2019-2021), Total \$60,042.

Co-I, "Anode Modification to Target Pb Removal for Drinking Water Purification using Inverted Capacitive Deionization", PHS 2016-02 Omnibus Solicitation of the NIH, CDC, FDA, and ACF for Small Business Innovation Research Grant Applications (Parent SBIR [R43/R44] to the National Institutes of Health, 18 months (2016-2018), Total \$15,165.

IP DEVELOPMENT

Abad, K. and Thompson, J.G., University of Kentucky Research Foundation, 2023. Radical Initiated Electrochemical Oxidation of PFAS using Low-Cost Electrodes. Invention Report 2753.

Thompson, J.G., Landon, J., Gao, X., Liu, K., **Abad, K.** and Bhatnagar, S., University of Kentucky Research Foundation, 2022. Electrochemical cell, method and apparatus for capturing carbon dioxide from flue gas and decomposing nitrosamine compounds. U.S. Patent Application 17/881,448.

Gao, X., Liu, K., Landon, J.R., Thompson, J., Omosebi, A.O., **Abad, K.** and Ma, Z., University of Kentucky Research Foundation, 2020. Apparatus to remove harmful chemical species from industrial wastewater using iron-based products. U.S. Patent Application 16/875,169.

MEMBERSHIPS

American Chemical Society
The National Society of Leadership and Success

SKILLS AND TRAINING

Instrumentation– Agilent TOF-MS, Dionex IC, Agilent ICP-MS, Agilent GC/MS, 3D Printer, PCR, Gel electrophoresis, microwave digestion
Software – Masshunter, MSD Chemstation, Chromeleon, JMP, Matlab, Cura

LANGUAGES

English– native language
Spanish speak fluently and read/write with high proficiency