

## CURRICULUM VITAE

### KEEMA ABAD

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## 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 Center for Applied Energy Research

Research Scientist Senior

2022-Present

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 CO<sub>2</sub> 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 CO<sub>2</sub> 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 CO<sub>2</sub> 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 from wastewater
- Analysis of samples included 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

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 CO<sub>2</sub> 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 CO<sub>2</sub> conversion to formic acid using engineered enzymatic catalysts in a batch reactor. *Journal of CO<sub>2</sub> 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 CO<sub>2</sub> chemical absorption. *International Journal of Greenhouse Gas Control* 2022, 116, 103646.

Thompson, J.; Matin, N.; Omosebi, A.; Moreno, D.; **Abad, K.**; Liu, K., Electrochemical CO<sub>2</sub> 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 CO<sub>2</sub> 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 CO<sub>2</sub> 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 CO<sub>2</sub> 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 CO<sub>2</sub> 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-CO<sub>2</sub> 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 CO<sub>2</sub> 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 CO<sub>2</sub>-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 CO<sub>2</sub> Capture Systems. *SSRN Electronic Journal* 2019.

Thompson, J.; **Abad, K.**; Bhatnagar, S.; Ghorbanian, M.; Nikolic, H.; Liu, K., UKy-CAER Hybrid CO<sub>2</sub> 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 CO<sub>2</sub> 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 CO<sub>2</sub> 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 CO<sub>2</sub> 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 CO<sub>2</sub> 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**, 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 CO<sub>2</sub> capture systems, PCCC-6, Virtual conference hosted from the UT-Austin, January 25-27, 2022

**Keemia Abad**, Shino Toma, Saloni Bhatnagar, Jesse G. Thompson, Kunlei Liu. High efficiency destruction of N-nitrosamines in waterwash solutions from CO<sub>2</sub> 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

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