Kandis Leslie Gilliard-AbdulAziz, Ph.D.

Gabilan Assistant Professor
University of Southern California
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RESEARCH GROUP

University of Southern California, Civil and Environmental Engineering **2024 –**
University of California, Riverside, Chemical and Environmental Engineering **2018 – 2023**
The Sustainable Catalysis and Materials Group [Link]

EDUCATION

Provost Postdoctoral Fellow, University of Pennsylvania, Department of Chemical and Biomolecular Engineering, Philadelphia, PA 2017 - 2018

Ph.D. Chemistry, University of Illinois, Urbana-Champaign, Department of Chemistry
Urbana, IL 2017

B.S. Chemistry, Temple University (Cum Laude), Department of Chemistry
Philadelphia, PA 2007

APPOINTMENTS

Wise Gabilan Assistant Professor of Civil and Environmental Engineering
University of Southern California 2024 -

Assistant Professor of Chemical and Environmental Engineering
University of California, Riverside 2018 – 2023

Provost Postdoctoral Research Fellow, Heterogeneous Catalysis
University of Pennsylvania 2017 – 2018

Research Assistant, Materials Chemistry, and Chemical Engineering
University of Illinois Urbana-Champaign 2011 – 2017

Forensic Scientist, Drug Chemistry
Philadelphia Police Department 2009 – 2011

Refinery Chemist, Sunoco Chemicals
Philadelphia Frankford Plant 2007 – 2009

FELLOWSHIPS AND AWARDS

- Sloan Research Fellow 2024
- Department of Energy Early Career Award 2023
- National Science Foundation Career Award 2022
- Material Science of Extreme Environments Young Investigator Award 2022
- Frontiers of Engineering Fellow hosted by the National Academy of Engineers 2021
- Scialog Negative Emissions Fellow 2021
- Hellman Junior Faculty Fellow 2020
- Provost Diversity Faculty Fellow, University of California, Riverside 2018 -
- Provost Postdoctoral Fellowship Scholar, University of Pennsylvania 2017 - 2018
- University of Illinois Graduate College Fellowship Fall 2011 – Fall 2013
- American Chemical Society Elli Lilly Travel Award Spring 2012
- Center for Advanced Theory Travel Award Spring 2012

SELECT PUBLICATIONS

Jo, S. and Gilliard-AbdulAziz, K.L., "Self-Regenerative Ni-doped CaTiO3/CaO for Integrated CO_2 Capture and Dry Reforming of Methane." Small, Accepted (2024)

Guo, H., Vahidi, H., Kang, H., Shah, S., Xu, M., Aoki, T., Rupert, T., Luo, J., Gilliard-AbdulAziz, K.L. and Bowman, W., "Tuning grain boundary cation segregation with oxygen deficiency and atomic structure in a perovskite compositionally complex oxide thin film.", Applied Physics Letters, Accepted (2024).

Guo, H., Mead, C., Balingit, M., Shah, S., Wang, X., Xu, M., Tran, I., Aoki, T., Samaniego, J., Gilliard-AbdulAziz, K.L., Lauhon, L., and Bowman, W.J., "Designing nanostructure exsolution-self-assembly in a complex concentrated oxide." Matter, 1002 – 1017, 7 (2024)

Jo, S., Woo, J., Nguyen, T., Kim, J., Kim, T., Ryu, H., Hwang, B., Chang Kim, J., Lee, SC, and Gilliard-AbdulAziz, K.L., "Zr-modified Ni/CaO Dual Function Materials (DFMs) for Direct Methanation in an Integrated CO2 Capture and Utilization Process." Energy and Fuels, 19680, 37 (2023)

Najimu, M., Jo, S. and Gilliard-AbdulAziz, K.L., "Co-exsolution of Ni-based Alloy Catalysts for the Valorization of Carbon Dioxide and Methane." Accounts of Chemical Research, 3132-3141, 22 (2023).

Woo, j., Jo., S. Kim, J., Kim, T.-Y., Son, H., Ryu, H-J., Hwang, B., Kim, J., Lee, S., and Gilliard-AbdulAziz, K.L., "Effect of Ni-to-CaO ratio on integrated CO2 capture and direct methanation." Catalysts, 1174, 13 (2023).

Jo, S., Son, H., Kim, T-Y., Woo, J., Ryu, D., Kim, J., Lee, S., Gilliard-AbdulAziz, K.L., "Ru/K_2CO_3–MgO catalytic sorbent for integrated CO_2 capture and methanation at low temperatures." Chemical Engineering Journal, 469, 143772 (2023)

Woo, J., Jo, S., Kim, J., Kim, T-Y., Son, H-D., Ryu, H-J., Hwang, B., Kim, J., Lee, S., Gilliard-AbdulAziz, K.L., "Effect of the Ni-to-CaO Ratio on Integrated CO_2 Capture and Direct Methanation" Catalysts, 13, 8, 1174 (2023)

Shah, S., Hong, J., Cruz, L., Wasantwisut, S., Bare, S. and Gilliard-AbdulAziz, K.L., "Dynamic Tracking of NiFe Smart Catalysts using *In Situ* X-Ray Absorption Spectroscopy for the Dry Methane Reforming Reaction." ACS Catalysis, 13, 6, 3990 (2023).

Shah, S., Xu, M., Pan, X., and Gilliard-AbdulAziz, K.L., "Complex Alloy and Heterostructure Nanoparticles Derived from Perovskite Oxide Precursors for Catalytic Dry Methane Reforming," ACS Appl. Nano Eng., 5, 12, 17476 (2022)

Jo, S., Cruz, L., Shah, S., Wasantwisut, S., Phan, A. and Gilliard-AbdulAziz, K.L., "Perspective on Sorption Enhanced Bifunctional Catalysts to Produce Hydrocarbons, " Perspective on Sorption Enhanced Bifunctional Catalysts to Produce Hydrocarbons," ACS Catalysis, 12(13) 7486 (2022).

Antolinez, C., Byrne, F., Wasantwisut, S., Rohula, T., Gilliard-Abdul-Aziz, K.L. and Rivera, M., "Assessment of Renewable Compounds as Biopesticides for Asian Citrus Psyllid, Diaphorina citric (Kuwayama) (Hemiptera:Liviidae)", Journal of Pest Science, 11, (2022)

Wasantwisut, S., Xiao, X., Feng, P., and Gilliard-AbdulAziz, K.L., "The Influence of High-Energy Faceted TiO_2 Supports on Co and Co-Ru Catalysts for Dry Methane Reforming," Chemistry An Asian Journal 17, e202101253 (2021).

Jo, S., Heon Lee, J., Kim, T., Woo, J., Ryu, H., Byungwook, H., Kim, J., Gilliard-AbdulAziz, K.L., "Sustainable CH_4 production from flue gas in a rapid cyclic system using nickel-lithium-silicate as catal-sorbent." Fuel 311, 122602 (2022)

Jo, S., Heon Lee, J., Kim, T., Woo, J., Ryu, H., Byungwook, H., Kim, J., Gilliard-AbdulAziz, K.L., "Coke-promoted Ni/CaO catal-sorbent in the production of cyclic CO and syngas." Sustainable Energy & Fuels *6(1), 81-88*, (2022)

Shah, S., Xu, M., Pan, X. and Gilliard-AbdulAziz, K.L., "Exsolution of Embedded Ni−Fe−Co Nanoparticles: Implications for Dry Reforming of Methane." ACS Applied Nano Engineering, 8(8):8626-8636 (2021),

Shah, S., Sayono, S., Ynzunza, J., Pan, R., Xu, M., Pan, X., and Gilliard-Abdul-Aziz, K.L., "The Effects of Stoichiometry on the Properties of Exsolved Ni-Fe Alloy Nanoparticles for Dry Methane Reforming." AIChE Journal: Futures Edition. 66(12):e17078. (2020)

BOOK CHAPTERS

Hirata, S., Gilliard, K., He, X., Kecili, M., Li, J., Salim, M., Sode, O., and Yagi, K., "Ab Initio Ice, Dry Ice, and Liquid Water," Fragmentation: Toward Accurate Calculations on Complex Molecular Systems edited by Mark S. Gordon (Wiley, Chichester, 2016).

PATENTS

Kandis Leslie Abdul-Aziz (First Inventor), Mark Gale, Ph.D., "Method for Preparing Activated Carbon." Provisional Patent (Application No. 63/323,292) –Filed 03/24/2022.

PROFESSIONAL SERVICE

Reviewer of Manuscripts: *ACS Omega, Physics Reports, ChemCatChem, Angewandte Chemie, Renewable Energy an International Journal, RSC Advance, ACS Catalysis*, Journal of Physical Chemistry, Nature Journal, JACS Au, ChemSusChem, ChemCatChem, Carbon, ACS Nano, Applied Catalysis B

Reviewer of Grant Proposals and Panels: *USDA, NSF CBET, DOE Technology Commercial Fund, NSF Environmental Sciences, ACS PRF, DOE Early Career program, NSF EPSCOR*

National Committees, Boards, and Societies: Pacific Coast Catalysis Society (2019 -), MRS Impact Award Subcommittee (2020 –), AIChE Catalysis and Reaction Engineering Board (2021 –), ACS Catalysis Early Career Editorial Board (2020), ChemSusChem Early Career Advisory Board (2022 -)

UNIVERSITY SERVICE

Department Committees (USC): *Visiting Scholar Committee* (2024 –)

Department Committees (UCR): *Preliminary Examination (2019 - 2021), Undergraduate Committee (2019 – 2020), Graduate Committee (2020 - 2022), Senior Design (2019 – 2020), Faculty Recruitment (2019), Marketing Committee (2018 – 2019)*

Panel Participant: *EntrepreneurA Summit, GradSuccess, Society of Women Engineers, Association of Women in Science*

TEACHING EXPERIENCE

Assistant Professor, Sonny Astani Department of Civil and Environmental Engineering
University of Southern California 2024 -

- Instruct and develop undergraduate environmental engineering courses, including, Environmental Chemistry and Lab (formerly Water Chemistry and Lab 363L) and Machine Learning for Sustainability (new course)
- Use current pedagogical techniques to engage with undergraduate students, including project and problem-based learning and flipped classroom strategies
- Lecture, recruit guest speakers, and supervise teaching assistants

Assistant Professor, Department of Chemical and Environmental Engineering
University of California, Riverside 2018 - 2023

- Instruct and develop undergraduate chemical engineering courses, including, Catalytic Reaction Engineering, Separations Unit Ops, Separation Processes, and Introduction to Nanoscale Engineering.
- Created new course electives, Sustainable Engineering Entrepreneurship and Heterogeneous Catalysis on Mars
- Use current pedagogical techniques to engage with undergraduate students, including project and problem-based learning and flipped classroom strategies
- Lecture, recruit guest speakers, and supervise teaching assistants

Instructor, College of Engineering
University of Illinois, Urbana-Champaign Spring 2013

- Lead the instruction of engineering undergraduates for service-learning courses to collaborate with non-profit partners Illinois Green Association

Teaching Assistant, Department of Chemistry
University of Illinois, Urbana-Champaign Spring 2012

- Led discussion sections for senior level physical chemistry course to clarify quantum chemistry concepts and graded homework assignments

Community Teaching Instructor, Association of Women in Forensic Sciences
Philadelphia, PA 2011

- Developed lessons and on-hand experiments with Forensic Scientists to engage girls in the forensic sciences
- Worked alongside community leaders to develop engaging programming to increase awareness of new illicit drugs of abuse

INDUSTRY EXPERIENCE

Founder/CEO
Nardo Technology, EnterpriseWorks December 2015 – June 2018

- Developed patent-pending portable electroanalytical sensor device to accurately identify narcotics, explosives, and biological agents.
- Participated in National Science Foundation I-CORP program to test feasibility of company.

Forensic Scientist II
City of Philadelphia, Police Department April 2009 – June 2011

- Performed quantitative and qualitative chemical analyses using wet chemical, microcrystalline and instrumental techniques to identify controlled substances, precursors, by-products and other substances used in the preparation and synthesis of illicit drugs.
- Designed new experiments to analyze new explicit "designer drugs" such as synthetic marijuana.
- Prepared technical reports for distribution to City, State, and Federal agencies.

- Testified in court as an expert witness on individual findings and chemical tests.

Quality Control Chemist
Sunoco Chemicals, Quality Control Laboratory September 2007 – April 2009

- Used knowledge of quality control regulated methods to test environmental, intermediate and finished product samples.
- Monitored and adjusted various inhibitors of plant products such as Glacial Acetic Acid used in the production area.
- Performed maintenance and ensured proper calibration of GC/MS, LC/MS, and UV/Vis Instruments.

INVITED ORAL PRESENTATIONS

"Creating Value from CO2 using Smart Alloy nano Catalysts" 02/2024
UC Irvine, Material Science and Engineering department

"Engineering Circular Solution to Derive Value out of Waste: Perspectives from the Sustainable Lab"
National Academies Board of Chemical Sciences Meeting 11/2023

"Job Talks: Navigating the Faculty Interview" 08/2023
Spark faculty Program, University of Illinois Urbana-Champaign

"Creating Value from CO_2 using Geo-inspired Perovskite Oxide Materials" 02/2022
Andlinger Center for Energy and the Environment, Princeton University

"The Multiplicity of DIMP Degradation using Aluminum Oxide" 06/2023
Materials of Extreme Environments Annual Meeting, Johns Hopkins University

"Carbon Capture and Utilization" (Lecture) 03/2023
Department of Chemical Engineering, Virginia Tech

"Creating Value from CO_2 using Novel Catalyst Development"
School of Forest Science and Natural Resources, University of Washington 04/2022

"Creating Value from CO_2 using Geo-inspired Perovskite Oxide Materials" 04/2022
Department of Chemistry and Biochemistry, University of California, Santa Cruz

"Creating Value from CO_2 using Geo-inspired Perovskite Oxide Materials" 02/2022
Department of Chemical Engineering, Carnegie Mellon University, Pittsburgh

"Creating Value from Waste and Pollution: Sustainable Chemical Processes to Promote A Circular Economy"
Department of Civil and Environmental Engineering, University of Southern California 02/2022

"Creating Value from CO_2 using Geo-inspired Perovskite Oxide Materials" 10/2021
Department of Chemical Engineering, University of California, Irvine

"Creating Value from CO_2 using Geo-inspired Perovskite Oxide Materials" 09/2021
Department of Civil and Environmental Engineering, University of Southern California

"Creating Value from Waste and Pollution: The development of sustainable
chemical processes to promote a circular economy" 04/2021
Department of Chemistry, Temple University

"Tailorable Ni-based Alloy Catalysts for Methane Dry Reforming" 03/2021
Catalysis Society of Metropolitan New York

"Moving Towards a Circular Economy: How Catalysis Can Drive Sustainability" 03/2021
Hellman Fellows Symposium, University of California, Riverside

"Thanos vs. Iron: The development of dynamic nickel-iron catalysts to usher in a carbon waste end game"
Department of Chemical and Environmental Engineering, University of California Riverside 02/2021

"Thanos vs. Iron: The development of dynamic nickel-iron catalysts to usher in a carbon waste end game"
Department of Chemical Engineering, Tufts University 11/2020

"Defect Engineering as a Tool to Tune the Activity, Selectivity and Stability of Ni-Fe Catalysts"
Department of Chemical and Materials Engineering, University of Southern California 10/2020

"Thanos vs. Iron: The development of dynamic nickel-iron catalysts to usher in a carbon waste end game"
Department of Material Science and Engineering, University of California, San Diego 10/2020

"Defect Engineering to Tune the Activity, Selectivity and Stability of Ni-Fe Catalysts" 06/2020
Department of Chemical Engineering (Catalysis Seminars), University of California Santa Barbara

"The Development of Smart Catalysts for a Sustainable Future" 03/2020
Catalytic Reaction Engineering Class, University of Oklahoma

"The Fundamentals and Role of Defects for Catalytic Applications in TiO_2 and $SrTiO_3$" 10/2018
Department of Material Science and Engineering, University of California, Riverside

"Crime Scene Investigation and Defects…Oh My" 11/2016
Department of Chemical Engineering, University of California, Berkeley

"Entrepreneurship at the University of Illinois in Urbana-Champaign" 05/2016
Entrepreneurship for Engineers Workshop, University of Illinois, Urbana-Champaign

"Surface Chemistry for Defect Engineering of Rutile TiO_2" 05/2016
Chemical Engineering Research Symposium, University of Illinois, Urbana-Champaign

"Cross Examination of Forensic Professionals" 04/2011
Beasley School of Law, Temple University

"Cross Examination of Forensic Professionals" 04/2010
Beasley School of Law, Temple University

CONFERENCE PRESENTATIONS

"Creating Value from CO2 using Smart Alloy Nano Catalysts"
National Academies US-Egypt Frontiers of Engineering 11/2023

"Creating Value from CO2 using Smart Alloy Nano Catalysts"
Sustainable Nanotechnology Organization 11/2023

"Thermally-stable Zr-modified Ni/CaO catal-sorbent for an Integrated CO2 Capture and Methanation Process."
Sustainable Nanotechnology Organization 11/2023

"Creating Value from CO2: The Development of Sorption-Enhanced Catalysts to Promote a Circular Economy."
International Materials Research Council 08/2023

"From Waste to Wealth: The development of sustainable chemical processes to promote a circular economy"
ACS, San Francisco 08/2023

"Creating Value from CO_2: The development of sorption-enhanced catalysts to promote a circular economy"
International Conference on CO_2 Utilization, Bari, Italy 06/2023

"Towards Sorption-Enhanced Catalysts for CO_2 Capture and Utilization"
ACS, Indianapolis 03/2023

"In situ X-ray Absorption Spectroscopy to Probe the Dynamics of Ni3Fe catalysts: Implications for Dry Methane Reforming"
AVS National Meeting, Pittsburgh 11/2022

"In situ X-ray Absorption Spectroscopy to Probe the Dynamics of Ni3Fe Catalysts: Implications for Dry Methane Reforming"
AIChE, Phoenix 11/2022

"Towards Sorption-Enhanced Catalysts for CO_2 Capture and Utilization"
International Symposium on Advanced Materials and Catalysts, Virtual 08/2022

"Mechanisms and Kinetics of Exsolved Ni-Fe Catalysts – Influence on Catalyst Performance for Dry Reforming of Methane"
North American Catalysis Society Meeting, New York 05/2022

"Exsolution of embedded NiFeCo nanoparticles: Implications for dry reforming of methane"
ACS, San Diego 03/2022

"Synthesis of Exsolvable Multi-Metallic Nanoparticles Using the Defect Chemistry of Perovskite Oxides"
AIChE, Boston, MA 11/2021

"Dual Functional Perovskite-Based Catalysts for CO_2 Sorption and Syngas Production"
AIChE, (Virtual) 11/2021

"Synthesis of Exsolvable Multi-Metallic Nanoparticles Using the Defect Chemistry of Perovskite Oxides"
AIChE, Boston, MA 11/2021

"Elucidating Alloying Strategies for Ni-Based Bimetals Using Geo-Inspired Perovskite oxides"
Material Research Society, (Virtual) 04/2021

"Elucidating the Support Effects of Perovskite Oxides for the Rational Design of Sinter-Resistant Catalysts"
AIChE, (Virtual) 11/2020

"Tunable Ni-Fe Catalysts for C1 Activation"
#ChemistLive, ACS Catalysis Division (Virtual) 09/2020

"Elucidating the Support Effects of Perovskite Oxides for the Rational Design of Sinter-Resistant Catalysts"
AIChE, (Virtual) 11/2019

"Elucidating Structure-Property Relationships for the Rational Design of Strongly Interacting Nanoparticles on Lanthanide Perovskites"
Material Science and Technology, Portland, Oregon 09/2019

"Elucidating the Design Rules for Smart Geo-Inspired Catalysts"
Pacific Coast Catalysis Society Meeting, Pullman, Washington 08/2019

SCIENCE OUTREACH AND MENTORSHIP

- **Faculty Mentor**
  Engineering and Entrepreneurship, University of California, Riverside 09/2022
  Workshop developed by Gilliard-AbdulAziz and Blackstone launchpad to help acclimate first generation transfer engineering students to the Bourns College of Engineering.
- **Faculty Mentor**
  SPARK Faculty Workshop, University of Illinois, Urbana-Champaign 08/2021- 2023
  Workshop that mentors women Ph.D. engineers for faculty positions in PUIs and R1 institutions
- **Faculty Advisor**
  Engineers without borders, University of California, Riverside 2020 – 2023
  Work on sustainability projects in Riverside County
- **Career Day Mentor**, Central Highschool (Philadelphia, PA) 05/2021
  Shared career path with alma mater about career path from chemist in Philadelphia to Professor
- **Entrepreneur Mentor**
  Young Entrepreneur Program, Centennial High school Spring 2016 – Fall 2016
  Mentor and assist high school students in the development and creation of a unique business in the Champaign-Urbana area.
- **Graduate Mentor**
  Girls in STEM, Society of Women Engineers Spring 2016
  Led discussion on semiconductor research and graduate school life to 15-18 year old high school students.
- **Recruiter Assistant**
  University of Illinois, Chemistry Department Fall 2012 – Fall 2015
  Assisted the Graduate Director of Diversity at large conferences to help in the recruitment of underrepresented minorities.
- **Business Consultant**
  Range of Motion Project, Ecuador Spring 2015
  Assisted in the construction of a cost/benefit model for the greater Ecuadorian region.
- **Secretary and Chair of Women Chemist Committee**
  University of Illinois, Chemistry Department 2014
  Organized outreach events such as workshops for the professional development of graduate women in chemistry and chemical engineering.

CURRENT AND FORMER GROUP MEMBERS

STUDENT ALUMNI

NAME	DEGREE	GRADUATION	EMPLOYMENT
Mark Gale	Ph.D.	2022	Harvey Mudd College
Soham Shah	Ph.D.	2023	Intel, Inc.
Luz Cruz	Ph.D.	2022	Intel, Inc.
Irene Cruz-Rubio	M.S.	2022	
Ernesto Betancourt	M.S.	2022	Yorke Engineering, LLC
Peter Nguyen	B.S.	2022	M.S. Program, UC Irvine
Jacob Graves	B.S.	2022	Solid Power, Inc.
Annette Phan	B.S.	2022	M.S. Program, UCR
Sebastien Banales	B.S.	2022	Ashworth Leininger Group
Oge Ogbechie	B.S.	2022	
Marissa Moreno	B.S.	2020	Research Assistant, UCSD
Mariyah Bandukwala	B.S.	2020	Brightmark, LLC
Thanvarath Pinyochon	B.S.	2020	
Samuel Sayono	B.S.	2019	EAG Laboratories
Ryan Pan	B.S.	2019	A2 Biotherapeutics, Inc.
Zhaoxi Yang	B.S.	2019	Ph.D. student, UCR
Jenna Yzunza	B.S.	2019	Ph.D. student, UC Davis
Monica Fajardo	B.S.	2019	Natural Fiber Welding

POSTDOCTORAL SCHOLARS

NAME	DEGREE	EMPLOYMENT DATES
Musa Najimu	Ph.D.	2023 -
Bruno Henrique Arpini	Ph.D.	2023 -

GRADUATE STUDENTS

NAME	DEGREE	EXPECTED GRADUATION
Somchate Wasantwisut	Ph.D.	2023
Tu Nguyen	Ph.D.	2023
Seongbin Jo (USC)	Ph.D.	2024
Naharin Jannath (USC)	Ph.D.	2026
Saiyed Fahim (USC)	Ph.D.	2026
Sairaj Patil (USC)	Ph.D.	2026