Faculty Mentors

(Research Affiliates)

Aiken
UNIVERSITY OF SOUTH CAROLINA

About Research Affiliate

The Research Affiliate program in the College of Science and Engineering (CSE) at USC Aiken plays a vital role in expanding applied research and programming in the sciences and engineering. This volunteer-based initiative provides research affiliates with institutional affiliation, enabling them to collaborate with faculty and staff on various projects while gaining access to laboratories, facilities, and specialized instrumentation.

Research affiliates may include active, retired, or independent researchers from the region. Recently, several new affiliates, including retirees from the Savannah River National Laboratory (SRNL), have joined the program to enhance applied research expertise and mentorship within CSE. Their contributions help strengthen research capabilities, support student development, and contribute to regional economic and workforce growth.

For inquiries or to express interest in the program, please contact **Dr. Scott McKay** at scott.mckay@usca.edu .

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Ragaiy Zidan, Ph.D.

Physics

Email: ragaiy.zidan@fuelx.tech

Areas of Expertise:

- Doped carbon nanotubes
- Amorphous metal hydrides
- Conventional metal hydrides
- Non-linear diffusion
- Computational physics
- Molecular dynamics
- Monte Carlo methods
- Percolation theory and Alanates
- Computer simulation of fractal-like systems

Biography:

Dr. Ragaiy Zidan is the Chief Technology Officer at FuelX Innovation Inc. He previously served as an Advisory Scientist at the Savannah River National Laboratory in Aiken, SC. Dr. Zidan specializes in hydrogen storage research and development, focusing on the advancement and characterization of novel materials, including alanates, doped carbon nanotubes, amorphous metal hydrides, and conventional metal hydrides.

In addition to his work in hydrogen storage, he is involved in the development of hydrogen separation membranes. His research interests also encompass non-linear diffusion, chaotic behavior in non-linear systems, computational physics, molecular dynamics, Monte Carlo methods, percolation theory, and the computer simulation of fractal-like systems.

Maximilian Gorensek, Ph.D., PE

Email: mbgorensek@gmail.com

Areas of Expertise:

- Chemical process modeling and simulation
- Biomass pyrolysis
- Carbon capture
- High-temperature water-splitting hydrogen production
- Nuclear materials processing
- Waste treatment

Biography

Dr. Max Gorensek retired as a Senior Fellow from the Savannah River National Laboratory (SRNL) in 2022 and continues to work there part-time. He holds a B.S. and an M.S. from Case Western Reserve University and a Ph.D. from Princeton, all in chemical engineering. Dr. Gorensek is also a registered Professional Engineer.

Recently, he served as co-Principal Investigator for the RAPID Center for Process Modeling, an AIChE-sponsored project aimed at developing chemical process models to support process intensification.

At SRNL, his research has focused on modeling and simulating various chemical processes, including biomass pyrolysis, carbon capture, high-temperature water-splitting hydrogen production, nuclear materials processing, and waste treatment. Prior to joining SRNL in 2002, he worked in the commercial chemical industry, where he covered process development, catalyst testing, modeling and simulation, flowsheet development, and technical support.

Dr. Gorensek has also served as an adjunct professor at the University of South Carolina (Columbia) and has

held the position of Associate Editor for the *International Journal of Hydrogen Energy*. He is an inventor with four patents and has authored approximately 40 peer-reviewed publications and book chapters. Additionally, he is a Fellow of the AIChE, a former director and past Chair of the Nuclear Engineering Division, and a recipient of the Robert E. Wilson Award.

Claudio Corgnale, Ph.D.
Mechanical Engineering

Email: Claudio.corgnale@ccenergyconsulting.com

Areas of Expertise

- Hydrogen storage
- Thermochemical energy storage systems
- Hydrogen compression and delivery systems
- Techno-economic-financial studies
- Material development research
- Experimental tests for cryogenic adsorbent systems

Biography

Dr. Claudio Corgnale is known internationally for his expertise in renewable energy systems, particularly in hydrogen systems and thermal energy storage. He has been actively involved in the design, assessment, and testing of hydrogen production processes.

Dr. Corgnale holds a Ph.D. in Mechanical Engineering and has a significant focus on hydrogen systems and thermal energy storage. His experience includes the design and testing of hydrogen production processes, hydrogen storage, thermochemical energy storage systems, and hydrogen compression and delivery systems.

He has conducted extensive techno-economic-financial studies, material development research, and coordinated experimental tests for cryogenic adsorbent systems, high-temperature materials, and high-pressure hydrogen absorption systems. While at the U.S. Department of Energy (DOE) Hydrogen Storage Engineering Center of Excellence, he developed techno-economic analysis models for solid-state hydrogen storage systems and transport models for

carbon and metal-organic framework adsorption materials.

Dr. Corgnale has led several multi-million-dollar projects funded by private entities and the DOE, which include renewable energy-driven hydrogen production plants, such as wind electrolysis plants, photoelectrochemical hydrogen production systems, thermochemical hydrogen production systems, alternative hydrogen compression systems (metal hydride compressors), and stationary regenerative fuel cell systems.

Bruce Hardy, Ph.D.
Nuclear Engineering

Email: bjh.nce212@gmail.com

Areas of Expertise

- Coupled mass, momentum, and energy transport
- Chemical thermodynamics
- Chemically reacting flows
- Porous media flows
- Electromagnetic fields
- Atomistic modeling

Biography

Dr. Bruce Hardy is an expert in mathematical modeling of physical processes, possessing extensive experience in fluid mechanics, diffusion, heat transfer, and nuclear engineering. He has collaborated with multiple universities and national laboratories to advance his research.

Dr. Hardy's work primarily focuses on the mathematical modeling of various physical processes, often supplemented by experimental work to obtain parameters and validate numerical models. His research interests encompass coupled mass, momentum, and energy transport, chemical thermodynamics, chemically reacting flows, porous media flows, and the applications of heat transfer and neutronics in nuclear engineering. He has also contributed to atomistic modeling.

In recent years, Dr. Hardy has led a collaboration between the University of South Carolina, Columbia, and the Savannah River National Laboratory (SRNL), developing machine learning algorithms to analyze

large datasets of microscopic images for identifying surface defects in containers for nuclear materials.

He has engaged in collaborative efforts with esteemed institutions such as Caltech, UC Berkeley, Georgia Tech, the University of Michigan, the University of Quebec, Los Alamos National Laboratory, Argonne National Laboratory, Pacific Northwest National Laboratory, the National Renewable Energy Laboratory, and the Oregon State University-Microproducts Breakthrough Institute. Dr. Hardy holds a Ph.D. in Nuclear Engineering from the University of Illinois at Urbana-Champaign.

His professional experience includes serving as a Senior Nuclear Engineer at Commonwealth Edison Company and working as an Engineer at the U.S. Army Construction Engineering Research Laboratory. Additionally, he has gained valuable experience as an Engineering Technician and Intern at Argonne National Laboratory.

Rose Hayes, Ph.D.

Anthropology

Email: rosehayes@aol.com

Areas of Expertise

- Medical anthropology
- Public health
- Occupational health programs
- Skeletal biology
- International technology transfer
- Nuclear waste management

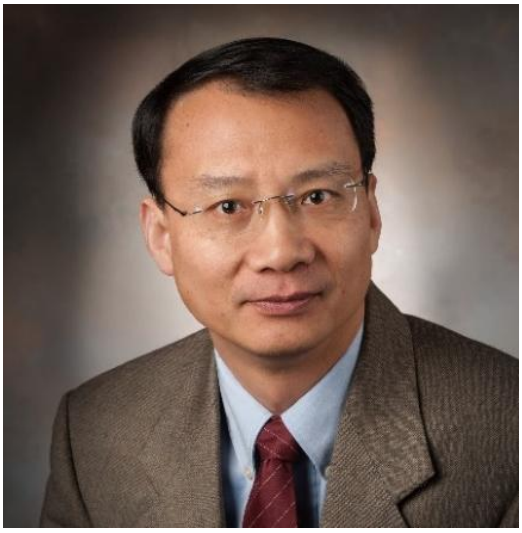
Biography

Dr. Rose Hayes is an expert in anthropology, with a distinguished career as a Medical Anthropologist specializing in public health. During the 1970s, she was actively involved in international technology transfer in the Nile Valley until she was compelled to leave due to the tragic murders of the American and Belgian ambassadors and their staff by Al Qaida.

Upon returning to the United States, Dr. Hayes taught at the State University of New York before accepting a position with the federal government, where she managed occupational health programs from 1980 to 2000. She holds B.S., M.S., M.A., and Ph.D. degrees, complemented by postdoctoral training in skeletal biology.

Throughout her career, Dr. Hayes has served on numerous national standards and advisory boards. She was appointed to the U.S. Department of Energy Advisory Board for the Savannah River Site from 2009 to 2015. Currently residing in Aiken, SC, she has been active in local governance, serving on Aiken city commissions and committees. Dr. Hayes is also a

member of the South Carolina Writers Association-Aiken chapter, where she has published both non-fiction and fiction works focusing on nuclear waste and its potentially world-threatening derivative poisons.



X. Steve Xiao, Ph.D.

Chemical Engineering

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Areas of Expertise:

- Catalysis and Energy statistics
- Reaction engineering
- Hydrogen isotope separation
- Chemistry
- Natural gas utilization and Climate change
- Petroleum processing
- Coal liquefaction and Robotics
- Biomass Conversion and Artificial intelligence
- Energy storage and nuclear fusion

Biography

Dr. X. Steve Xiao started his career in 1985 and experienced various energy-related technology development, encompassing 16 years in the petrochemical industry, 18 years at the U.S. Department of Energy's Savannah River National Laboratory, and research/adjunct faculty member at University of Pittsburgh. Recently, Dr. Xiao led the electronics group at SRNL, focusing on Asymmetric Engineering - a field aligned with his passion on industrial automation, electronics, nuclear fusion and artificial intelligence.

A recipient of the prestigious SRNL Donald Orth Lifetime Achievement Award, Dr. Xiao is the world leading expert on hydrogen isotope separation. His research interests also include energy efficiency, alternative energy, and environmental studies for risk assessments related to energy usage. He holds a portfolio of 75 patents and patent applications, with approximately 45% having been commercialized.

Additional Faculty Mentors

In addition to research affiliates, USC Aiken offers valuable mentorship opportunities through the **Research Mentor**. This initiative connects students with experienced faculty mentors who provide guidance and support in various aspects of research, professional development, and academic growth.

Faculty mentors play a crucial role in fostering a strong research culture within USC Aiken, helping students develop critical thinking skills, refine their research methodologies, and gain hands-on experience in their respective fields. These mentors come from various departments across the university.

By engaging with faculty across these disciplines, students gain diverse perspectives, interdisciplinary research opportunities, and valuable mentorship that prepares them for academic and professional success.