

**CAES Associate Director Quarterly Report**  
**Idaho State University, FY22Q1: October, November, December 2021**

**Section 1. Publications on behalf of CAES**

Scott Wahlquist, **Amir Ali**, SuJong Yoon, Piyush Sabharwall "Laminar Flow Heat Transfer in Helical Oval-Twisted Tube Heat Exchanger" *Frontier of Heat and Mass Transfer Journal* (Submitted for review in November 2011).

Wesley Yockey, **Amir Ali**, **Chad Pope**, 2022 "Development of a new control rod drive mechanism design for the ISU-AGN-201M reactor", *Annals of Nuclear Energy*, Vol. 167, 108817 (online since November 2021).

DOE-NEUP Final Report (lead by the University of Wisconsin): Critical Heat Flux Studies for Innovative Accident Tolerant Fuel Cladding Surfaces, DE-NE0008681. **Amir Ali**

Z. Free, M. Hernandez, **M. Mashal**, and K. Mondal (2021). A Review on Advanced Manufacturing for Hydrogen Storage Applications. *Special Issue Materials and Advanced Manufacturing for Sustainable Energy Applications*, *mdpi Energies*, 14 (24): 8513. [https://www.mdpi.com/journal/energies/special\\_issues/SEA](https://www.mdpi.com/journal/energies/special_issues/SEA)

**Section 2. Conferences Attended on behalf of CAES**

Synthesis and Characterization of rigid tetra-alkyl phosphonium based task specific ionic liquids (TSILs), Mateen, S., K.; **Rodriguez, R.**, Baek, D. L., Fox, R.V., **Pashikanti S.**, American Chemical Society, Spring symposium 2022 (Accepted).

B. Starks, K. Robinson, B. Sitaula, **A. M. Chrysler**, " Physical Layer Wireless Security Through the Rotation of Polarized Antennas," in *2021 IEEE International Symposium on Antennas and Propagation (APSURSI)*, Singapore City, Singapore, 2021.

**Uma Shankar Medasetti**, "Virtual Reality and Augmented Reality as Novel Tools for Training of Emergency Responders" 6th Annual International Conference of the Campus Alliance for Advanced Visualization (CAAV 2021) hosted by Purdue University, November 1-4, 2021 (virtual presentation).

**Jack Dunker**, "RDD Training Utilizing VR and Live Training" 6th Annual International Conference of the Campus Alliance for Advanced Visualization (CAAV 2021) hosted by Purdue University, November 1-4, 2021 (virtual presentation).

**Sections 3. Submitted Proposals Related to CAES Activities, FY21Q4**

Lead PI	Admin Unit	Title	Sponsor	Status
Mostafa Fouada	Electrical Engineering	Towards Secure 6G Cell-Free Communicatio...	ORAU	Submitted
Mostafa Fouada	Electrical Engineering	Collaborative Research: NeTS: JUNO3: SWI...	NSF	Submitted
Rene Rodriguez	Chemistry	ISU - Support for Transient Spectrokinet...	BEA	Funded
Mustafa Mashal	Civil/Environmntl Engineering	Radiological Dispersal Device Training (...)	BEA	Funded
Daniel LaBrier	Nuclear Eng/Health Physics	Informative Design of High Temperature M...	BEA	Funded

### Section 3.5. Funded Awards related to CAES Activities , FY21Q4

Lead PI	Admin Unit	Title	Sponsor	Status
Rene Rodriguez	Chemistry	ISU - Support for Transient Spectrokinetic Measu...	BEA	Funded
Rene Rodriguez	Chemistry	Synthesis, Characterization, and Testing of Cata...	BEA	Funded
Chad Pope	Nuclear Eng/Health Physics	U.S-Brazil Joint Study to Assess Market and Comm...	BEA	Funded
Vince Bowen	ESTEC	Nuclear Operations AGN-201 reactor	ICTE	Funded
Vince Bowen	ESTEC	NuScale SMR simulator	ICTE	Funded
Mustafa Mashal	Civil/Environmntl Engineering	Radiological Dispersal Device Training (...)	BEA	Funded
Daniel LaBrier	Nuclear Eng/Health Physics	Informative Design of High Temperature M...	BEA	Funded

### Section 4. Patents, Licenses, other IP - None

### Section 5. Other Awards - None

### Section 6. Graduated CAES-affiliated students

Maya Hernandez (BS) (Biochemsitry) **Rene Rodriguez**

Kofi Tuffour-Achampong (M.S.) (Nuclear Science and Engineering) **Mary Lou Dunzik-Gougar**

Morgan Robbins, Jordan Harley, Eslam Ali (Nuclear Science and Engineering) **Dan LaBrier**

Daniel Garz (MS), Aashish Thapa (MS) Civil Engineering) **Mustafa Mashal**

### Section 7. Continuing CAES-affiliated students

Tanner Mauseth (PhD), Scott McBeath (PhD), Austin Tam (PhD), Malwina Wilding (PhD), Todd Sherman (PhD)

(Nuclear Science and Engineering) **Mary Lou Dunzik-Gougar**

Scott Wahlquist, Kyle Schroeder (Nuclear Engineering) **Amir Ali**

4 BS and 1 MS students (Chemistry) **Josh Pak / Cori Jenkins**

Students associated with Disaster Research Center (**Mustafa Mashal**)

Jared Cantrell (PhD Student, Department of Civil and Environmental Engineering)

Mahesh Acharya (PhD student, Department of Civil and Environmental Engineering)

Kathryn Hogarth (Masters Student, Department of Civil and Environmental Engineering)

Mahesh Mahat (Masters Student, Department of Civil and Environmental Engineering)

Kabiraj Phuyal (Undergraduate Student, Department of Civil and Environmental Engineering)

Josh Peck (Undergraduate Student, Department of Civil and Environmental Engineering)

Gage Cussins (Undergraduate Student, Department of Civil and Environmental Engineering)

Lwin Htun (Undergraduate Student, Department of Civil and Environmental Engineering)

Uma Shankar Medasetti (PhD Candidate, Department of Mechanical Engineering)

Roy Dunker (Masters Student, Department of Nuclear Engineering – Health Physics)

Zach Free (Masters Student, Department of Mechanical Engineering)

Dr. Meesha Iqbal (Masters Student, Department of Community and Public Health)

Nirajan Bhattarai (PhD Student, Pharmacy)

Shishir Khanal (Masters Student, Department of Mechanical Engineering)

Berenice Sosa Aispuro (Undergraduate Student, Departments of Mechanical and Nuclear Engineering)

Claire Haupt (Undergraduate Student, Department of Mechanical Engineering)

Maya Hernandez (Undergraduate Student, Department of Chemistry)

Sindi Banda (Undergraduate Student, Business Informatics)

Pawan Acharya (Undergraduate Student, Department of Computer Science)

**Section 8. Incoming CAES-affiliated students**

Jacob Egbert (BS) (Chemistry) **Rene Rodriguez**

Abby (Abigayle) Hargreaves, John Stemkoski, Sutapa Biswas (Nuclear Engineering) **Dan LaBrier**

Students associated with Disaster Research Center (**Mustafa Mashal**)

Jose Duran (Masters Student, Department of Civil and Environmental Engineering)

Ahmad Zaied (Masters Student, Department of Civil and Environmental Engineering)

Joe Shurtleff (Undergraduate Student, Department of Civil and Environmental Engineering)

**Section 9. Joint Appointments (continuing)**

Chad Pope (nuclear engineering)

Sean McBride (cybersecurity)

Larry Leibrock (cybersecurity)

David Rodgers (CAES AD)

**Section 10. New Equipment - None**

**Section 11. Collaborative Research:**

(1) ISU-CAES Seed Grant Program

**(Ongoing Research in FY21Q1)**

ISU PI	ISU Department	ISU co-PIs	University co-PIs	INL co-PI	Project
Ali, Amir	NE		David Arcilesi (UI)	Piyush Sagharwall	Small-Scale Heat Exchanger Thermal Performance Facility
Jenkins, Cori	Chemistry	Josh Pak		Chris Zarzana Brittany Hodges	Urethane degradation analysis for upcycling and designing sustainable plastics
Leung Solomon	CE		Yaqiao Wu (BSU MaCS)	Don Wood	Sorption Removal of Gaseous Fission Products in Nuclear Fuel Reprocessing by MCM-41, TiO <sub>2</sub> , and their Functionalized Derivatives
Mashal, Mustafa	CE	Bruce Savage Jared Cantrell Roy Dunker		Rajiv Khadka Xingue Yang John Koudelka Maya Redden Bryon Marsh Shad Keele Michael Shurtleff	The Use of Emerging Technologies for Training of Emergency Responders
Murray, Kendra	Geosciences		Nick Bulloss (BSU MaCS)	Xiaofei Pu	Olivine phenocryst evolution in the Snake River Plain basalt flows that underlie the INL
Pashikanti, Srinath	Pharmacy/Chemistry	Rene Rodriguez		Robert Fox Donna Baek	Synthesis of Conformationally-Rigid Tetralkyl phosphonium based Ionic Liquids for extraction of critical element Cobalt
van Woerden, Irene	Community & Public Health			Rae Moss	Perceptions of INL and Nuclear Energy in the local community

**(New Research awards in FY21Q1)**

ISU PI	ISU Department	ISU co-PIs	University co-PIs	INL co-PI	Project
Ali, Amir	Nuclear engineering			Yasir Arafat	Performance optimization of MARVEL Microreactor power conversion system
Bodily, Paul	Computer Science			Rajiv Khadka	Application of Advanced Computational Theory to Facilitate Efficient Solutions to Real-World Combinatorial Problems
Forest, Tony	Physics			Chuting Tan	A neutron Generator for Materials Testing
Fouda, Mostafa	Electrical & Computer Engineering			Ahmed Hamed	Smart Analytics of Biomass Images
Kalivas, John	Chemistry			John Koudelka	Virtual Reality for Dynamic Data Visualization of Analytical Chemical Data
Mashal, Mustafa	Civil Engineering	Dan LaBrier Jared Cantrell		Som Duhlipala Amit Jain	Machine Learning-Aided Validation of a Sustainable and Highly Durable Construction Technology for the Containment Facility of Advanced Reactors
Pashikanti, Srinath	Biomedical and Pharmaceutical Sciences	Rene Rodriguez		Robert Fox Donna Baek	Incorporation of Sterics in novel Phosphonium Ionic Liquid (PIL) and their Effect on Ligand Intermolecular Interactions and Chelation Properties
Savage, Bruce	Civil Engineering	Chikashi Sato Jim Mahar Mustafa Mashal	Karen Humes, UI Dakota Roberson, UI		Water Storage Infrastructure Viability using Repurposed Tires for Pumped Hydro
Weber, Keith	GIS TReC		Kathleen Araujo BSU Cassandra Koerner, BSU	Kelly Wilson Ryan Hruska Shiloh Elliot Chris Forsgren	The Power Grid/Wildfire Nexus: Using GIS and Satellite Remote Sensing to Identify Vulnerabilities
Xu, Danny	Biomedical and Pharmaceutical Sciences		Kenneth Cornell, BSU	Eric Whiting	Hearing Loss Prevention through Integrative High Performance Computing, Data Science, and Experimental Biology

(2) Other collaborations

"Measuring Mechanical Properties of Select Layers and Layer Interfaces of TRISO Particles via Micromachining and In-Microscope Tensile Testing", **Mary Lou Duzsik-Gougar**, **Dan LaBrier**, Subhashish Meher (INL) and Fei Teng (INL)

**Preproposal selected for the full application by DOE-NEUP:** Experimental and Numerical Study on the Impact of Fission Gas Ejection from Failed Fuel Rods on the Safety of Lead-Cooled Fast Reactors. **Amir Ali (PI)**, Co-PIs: University of New Mexico (UNM), Argon National Laboratory (ANL), and Westinghouse Electric Company (WEC)

Chemical Interactions between Molten Sodium & Standard Insulation Types; (start-up and ISU CAES Seed Grant funding), collaborative project w/INL, **Dan LaBrier (ISU)**  
ATR-C & ATR Gamma Tube - Student Engagement (**Dan LaBrier (ISU)**, Dave Schoonen, Ryan Little, Monica Dudenhoeffer – all INL; Rich Christensen – UI; Brian Jaques – BSU)  
Use of UHP Concrete in Nuclear Applications (**Dan LaBrier (ISU)**, **Mustafa Mashal**, **Arya Ebrahimpour** – ISU; Kunal Mondal, Drew Johnson, Elmar Eidelpes – INL)  
“Disaster Preparedness and Response Conference”, submitted to the Center for Advanced Energy Studies (CAES) for \$50,000. PI = **Mustafa Mashal**; Co-PIs = Bryon Marsh, Rajiv Khadka, John Koudelka (INL).  
“Recycled Concrete Aggregate for Eco-Friendly Construction in Idaho” submitted to ISU for \$8,000 for Undergraduate Research Funds. The proposal was funded.  
“Green and Sustainable Concrete Mixes for INL’s Infrastructure” \$15,000 from the Center for Advanced Energy Studies (CAES) Shark Tank Competition, Battelle Energy Alliance. PI = **Mustafa Mashal**.

## **Section 12: Other Activities**

None