

**Idaho State University CAES Quarterly Report**  
**FY21-Q1 (October, November, December 2020)**  
compiled by David Rodgers, CAES Associate Director

**The ISU CAES Team includes these faculty, staff, and students**

CAES Funded Faculty/Staff: David Rodgers, Kristi Moser-McIntire, David Beard, Mary Lou Dunzik Gougar, Kavita Sharma, Sean McBride, Dan LaBrier, Amir Ali, Leslie Kerby, Mustafa Mashal, Irene Van Woerden, Anna McCarrey, Rene Rodriguez, Richard Schultz

CAES Affiliate Faculty: George Imel, Vince Bowen, Larry Leibrock, Josh Pak, Cori Jenkins, Andrew Chrysler, Mostafa Fouda, Bruce Savage, Keith Weber

Graduate students mentored by ISU Faculty on CAES-related projects (37 total)

Maria Tangarife, Wyatt Radke, Laura-Louise Aliche, (Savage)

David Coll Segarra (Imel)

Guy Tillit, Molly Ballinger, Dave Zirker (Moser-McIntyre)

Myranda Young, Jason Stefanik, Bailey Vahsoltz, Philomon Bileng, Kali Castle (Rene Rodriguez (ISU), Rebecca Fushimi, Donna Baek (INL), Kris Campbell (BSU))

Jared Cantrell, Uma Shankar Medasetti, Zach Free, Shishir Khanal, Katie Hogarth, Daniel Garz, Mahesh Acharya, Samantha Kerr, Rachel Brownell, Kabiraj Phuyal, Rachel Brownell, Mahesh Mahat, Gage Cussins, Josh Peck (Mashal)

Morgan Robbins, Eric Martinez, Eslam Ali (LaBrier)

Scott Wahlquist (Ali)

Brittany Grayson, Chase Juneau, Pepo Mena, Aaron Johnson, Patience Lamb, Emily Elzinga, Kallie McLaren, (Kerby)

**Publications**

D. LaBrier, **C. L. Pope**, W. Marcum, Revitalization of Sodium-Cooled Fast Reactor Competence through the Development of a U.S.-Based Sodium Technology School, *Transactions of the American Nuclear Society*, **123** (2020), DOI: 10.13182/T123-32868.

E. S. Lum, **C. L. Pope**, Simulation of the Fast Reactor Fuel Assembly Duct-Bowing Reactivity Effect using Monte Carlo Neutron Transport and Finite Element Analysis, *Nuclear Technology*, DOI: 10.1020/00295450.2020.1794190.

**C. L. Pope**, E. Lum, *Nuclear Reactor Thermal Expansion Reactivity Effect Determination Using Finite Element Analysis Coupled with Monte Carlo Neutron Transport*, (2020) DOI: <http://dx.doi.org/10.5772/intechopen.93762>. (Book Chapter)

Ionic Liquids for The Removal of Sulphur and Nitrogen Compounds in Different Fuel Systems. Evelin Noris, Peyton Kiggins, Bryson Blad, Karl De Jesus, Srinath Pashikanti, **Kavita Sharma**. *Environmental Chemistry Letters* (Accepted)

Effect of Sono-Catalytic Transfer Hydrogenation and In-Line Characterization on Upgrading Pyrolysis-Derived Oil; Samuel Hansena, Amin Mirkouei\*, Maria Magdalena Ramirez-Corredores, **Kavita Sharma**, Robert Spiers, John H. Kalivas, and Ethan Struh; Journal: Ultrasonics Sonochemistry (Accepted)

Potential applications of task specific ionic liquids for lanthanide and actinide present in spent nuclear fuel partitioning and in electronic waste. **Kavita Sharma**, Karl De Jesus, **Rene Rodriguez**. *Journal of Molecular Liquids* (Revision)

Extraction, Isolation and Characterization of Bioactive Compounds from Artemisia and their Biological Significance: A review. Rosemary Anibogwu, Karl De Jesus, Srinath Pashikanti, **Kavita Sharma**. *Journal of Food and Drug Analysis* (Submitted)

### Conferences

Amir Ali: Two presentations of CAES research to the American Nuclear Society Winter Meeting in November 2020

### Proposals/Awards

Lead PI	ISU Admin Unit	Proposal Title	Sponsor	Initial Request	Status
Daniel LaBrier	Nuclear Eng/Health Physics	Informative Design of High Temperature M...	Battelle Energy Alli...	\$25,854	Funded
Leslie Kerby	COSE Informatics / Comp Sci	Develop an effective artificial intellig...	Battelle Energy Alli...	\$11,999	Funded
Chad Pope	Nuclear Eng/Health Physics	Accelerating the Experimental Mission of...	Oregon State Univers...	\$185,319	Submitted
Chad Pope	Nuclear Eng/Health Physics	Idaho State University Support of CAES N...	Battelle Energy Alli...	\$9,980	Funded
Chad Pope	Nuclear Eng/Health Physics	Light Water Reactor Sustainability	Battelle Energy Alli...	\$64,965	Funded
Rene Rodriguez	Chemistry	Support for Raman Spectroscopic Capabili...	Battelle Energy Alli...	\$4,022	Funded
Richard Schultz	CAES-Ctr for Adv Energy Stud.	SMR-160 Integral and Separate Effects Te...	Battelle Energy Alli...	\$49,407	Funded
Keith Weber	GIS Training - Research Ctr	DISES: Advancing Policy and Dynamic Risk...	Boise State Univ - B...	\$20,556.00	Submitted

\$372,102

### New and Ongoing Partnerships

Keith Weber:

Collaborative grant proposal with Kathy Araujo (BSU)

Josh Pak & Cori Jenkins:

Project Title: Urethane degradation analysis for upcycling and designing sustainable plastics. Partners are Drs. Chris Zarzana and Brittany Hodges (INL)

Mustafa Mashal

1. Dr. Gavin Hawley's team (Department Manager, Systems Science and Engineering; Technical Lead, Nuclear Safety Program at Idaho National Laboratory), discussed the DRC project, opportunities for interns from ISU at INL, and other areas of research interest such as instrumentation, energy security, UAS, Internet of Things etc. Gavin will let ISU know when an opportunity arises for internship or research project.

2. Brett Carlsen, Josh Jarrell's group (Manager, Used Fuel Management Department); Ron Harwell's group (Manager, Engineering Structural & Seismic Analysis) all from the Idaho National Laboratory, discussed opportunities for research in Ultra-High-Performance Concrete (UHPC) in used fuel management, storage, decontamination, containment facility, and other applications. Funding opportunities are such as LDRD are being pursued for this research.

3. Dr. Eric Belmont, Associate Professor at the University of Wyoming. Dr. Mashal and Dr. Andrew Chrysler from ISU are collaborating with Dr. Belmont on a National Science Foundation EPSCoR Research Infrastructure Improvement Program: Track-2 Focused EPSCoR Collaborations (RII Track-2 FEC) grant titled "RFID Systems for Advanced Infrastructure and Energy Systems Monitoring". The internal pre-proposal by Drs. Chrysler and Mashal was successful.

4. The proposal titled "The Use of Emerging Technologies for Training of Emergency Responders" was submitted for CAES-ISU funding for \$20,000 (Jan – Dec 2021). PI = Mustafa Mashal; Co-PIs = Bruce Savage, Jared Cantrell (Civil and Environmental Engineering); Roy Dunker (Environmental Monitoring Laboratory); Rajiv Khadka, Xingyue Yang, John Koudelka, Maya Redden, Uma Shankar Medasetti (Applied Visualization Laboratory – Nuclear Science & Technology); Bryon Marsh, Shad Keele (National & Homeland Security); Michael Shurtliff (Energy & Environment Science and Technology) – The proposal was funded.

5. Submitted a \$50k proposal titled "Laboratory Operations Safety Academy (LOSA) – COVID19 Pilot Program" to CAES in collaboration with INL and IBEC. PI = Mustafa Mashal; several Co-PIs from ISU, IBEC, and INL.

#### Dan LaBrier

Project 1: Heat Treatment and Autoclave Testing for Novel Hydraulic Loop Coupling; BEA Subcontract 154652-62 (Nate Oldham, Tom Maddock, Nic Woolstenhulme, all INL)

Project 2: Integrated Sensor Development for Used Fuel Storage Canisters; BEA Subcontract 154652-79 (Evans Kitcher, Phil Winston, Michael Fanning, all INL)

Project 3: Chemical Interactions between Molten Sodium & Standard Insulation Types; self-funded (using ISU CAES Seed Grant funding), collaborative project w/INL

#### Amir Ali

Project 1: Development of an Innovative Heat Exchanger Technology for Nuclear Applications (Piyush Sabharwall-INL)

Project 2: Temperature Effects on Surface Wettability and Critical Heat Flux Prediction of Accident Tolerant Fuel (ATF)

Project 3: Small-Scale Heat Exchanger Thermal Performance Facility (David Arcilesi-UoI, Piyush Sabharwall-INL)

Project 4: Initiate collaboration with INL Modeling and Simulation team to support developing Heat Pipe experimental capabilities in CAES. Collaboration efforts recognized in submitted CSVFP proposal and submitting INL-CAES collaboration proposal in the coming few days.

## **Engagement/Other impacts**

### Educational Pipeline

1. CAES Safeguards and Security Graduate Certificate Development. Led by INL (Liam Boire), Co-PIs Chad **Pope** – (ISU), Araujo – (BSU), Bernards (UI), and Borowczak (UW)
2. Working with INL researchers, ISU created a new undergraduate computer science cybersecurity certificate and a new graduate secure cyber operations certificate, both of which will appear in the ISU 2021-2022 catalog. (**David Beard**)
3. ISU cybersecurity courses are being planned for Fall 2021 with BOISE STATE, and ISU is working with INL for a Summer SUPPLY CHAIN MICRO CERTIFICATE COURSE (**Larry Leibrock**)

### Meetings, Presentations

Mostafa Fouda: Attended two seminars related to wireless communications and cybersecurity.

Andrew Chrysler: Attended the INL 5G workshop

Keith Weber: Power grid risk due to wildfires meetings with various colleagues around the state/region.

Rene Rodriguez: Presentation to BSU Computer Science and Electrical Engineering Dept: “Raman Spectroscopy in Semiconductor Processing and Characterization”