

DOE-FIU Cooperative Agreement Annual Research Review – FIU Year 3

Wednesday, August 23, 2023		
9:00 - 9:05 am EDT	Kick-Off /Welcoming Remarks (DOE-EM)	Rod Rimando (Acting Director, Technology Development) – DOE EM-3.2
9:05 - 9:10 am EDT	Welcoming Remarks (DOE-LM)	Ms. Jalena Dayvault (Site Manager) – DOE LM
9:10 - 10:40 am EDT	Project 2: Environmental Remediation Science & Technology	FIU, DOE HQ, SRNL, PNNL, ORNL, LANL, LBNL, CBFO
10:40 am - 12:10 pm EDT	Project 1: Chemical Process Alternatives for Radioactive Waste	FIU, DOE HQ, PNNL, WRPS, SRNL, SRS
LUNCH BREAK [12:10 – 1:30 pm]		
1:30 - 3:00 pm EDT	Project 3: Waste and D&D Engineering & Technology Development	FIU, DOE HQ, SRNL, PNNL, LBNL, INL, ANL
Thursday, August 24, 2023		
9:00 - 10:30 am EDT	Projects 4 & 5: STEM Workforce Development and Training	FIU, DOE HQ (EM & LM), SRNL, PNNL, WIPP, SRS, ORP, LBNL, WRPS, INL, Grand Junction
BREAK [10:30 – 10:35 am]		
10:35 - 12:00 pm EDT	Wrap Up (FIU Projects 1, 2, 3, 4 & 5)	FIU, DOE HQ (EM & LM)



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PROJECT 5

Long-Term Stewardship of Environmental Remedies: Contaminated Soils and Water and STEM Workforce Development

FIU Personnel and Collaborators

Principal Investigator: Leonel Lagos

Program Manager: Ravi Gudavalli

Faculty/Staff: Anthony Abrahao, Pieter Hazenberg, Angelique Lawrence

DOE LM Fellows: Olivia Bustillo*, Shawn Cameron

DOE-LM: Carmelo Melendez, Jalena Dayvault, David Shafer

DOE-EM:, Kurt Gerdes, Genia McKinley, Jean Pabon

* Former DOE Fellow



Project Tasks and Scope

TASK 1: USE OF APATITE FOR URANIUM SEQUESTRATION AT OLD RIFLE SITE

TASK 2: CLIMATE RESILIENCY STUDIES FOR LONG-TERM SURVEILLANCE OF DOE-LM SITES

TASK 3: STEM WORKFORCE DEVELOPMENT – LM FELLOWS SELECTION

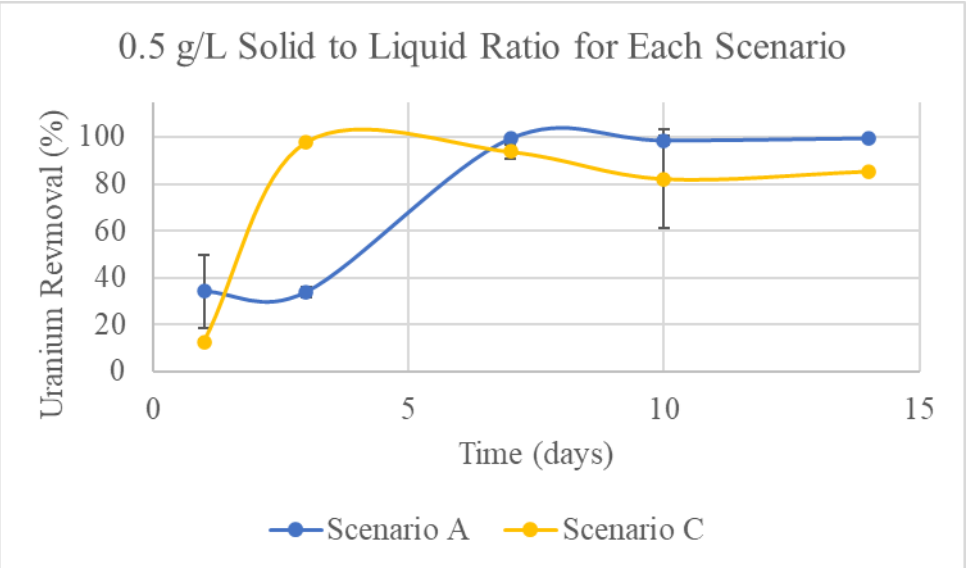


Task 1

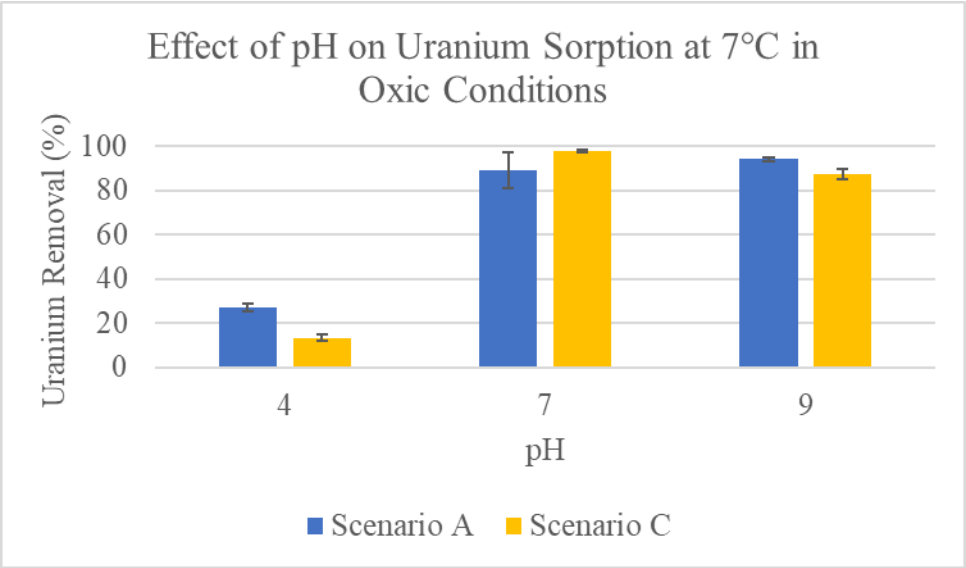
Use of Apatite for Uranium Sequestration at Old Rifle Site



FIU Year 3 Highlights: Hydroxyapatite



**Uranium Removal Over Time for 0.5 g/L
Solid to Liquid Ratio**



**Effect of pH on Uranium Sorption at 7°C in
Oxic Conditions**

Composition of calcium, citrate, and phosphate

	Scenario A	Scenario B	Scenario C
Calcium Concentration	40 mM	80 mM	40 mM
Citrate Concentration	100 mM	100 mM	100 mM
Phosphate Concentration	45 mM	45 mM	90 mM

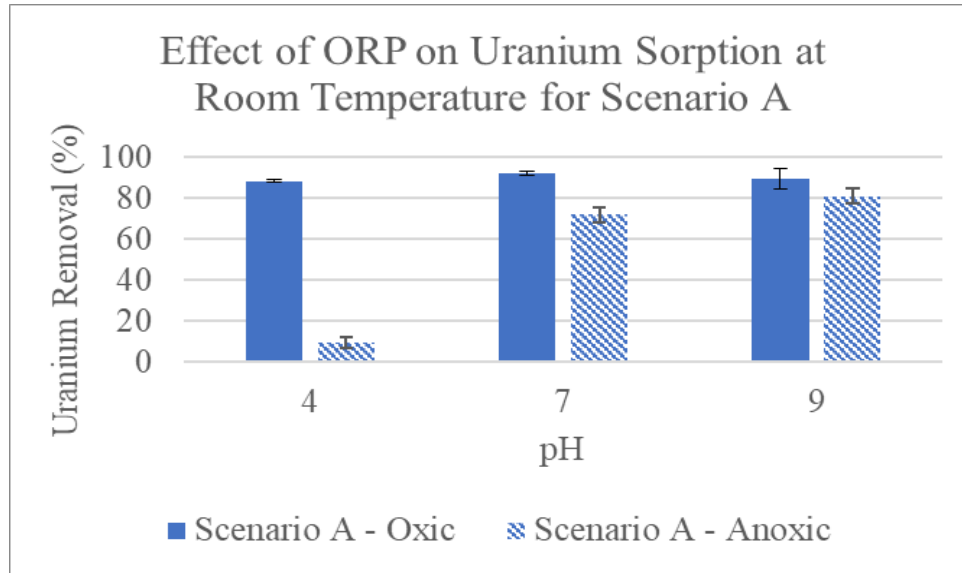
Environmental Conditions Studied

Temperature	pH			ORP
	4	7	9	
Low (7°C)	Condition 1	Condition 2	Condition 3	Oxic
Room (22°C)	Condition 4	Condition 5	Condition 6	Oxic
Room (22°C)	Condition 7	Condition 8	Condition 9	Anoxic

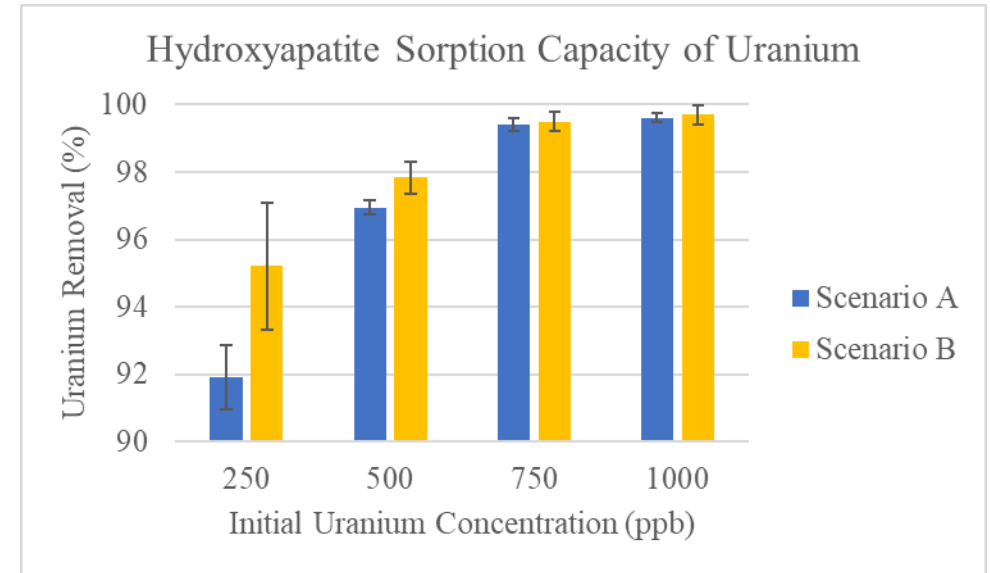


Task 1: Use of Apatite for Uranium Sequestration at Old Rifle Site

FIU Year 3 Highlights: Hydroxyapatite



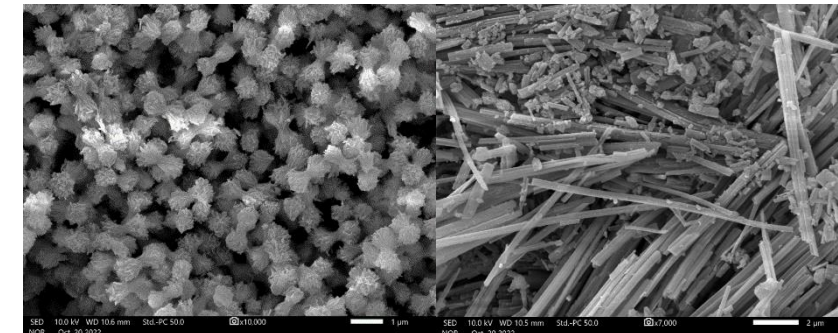
Effect of ORP on Uranium Sorption at Room Temperature for Scenario A



Hydroxyapatite Sorption Capacity of Uranium

- Poster presented at WM23 won the **ASME Best Poster Award**
- Paper submitted to WM23 received **Superior Paper Award**

On behalf of WM Symposia, I would like to congratulate you on winning the ASME Best Poster/Paper Award at the WM2023 Conference, for Paper #23442 "Interaction of Hydroxyapatite and Uranium in Groundwater at the Old Rifle Site to Facilitate Site Remediation", presented in Session #95.



Task 1: Use of Apatite for Uranium Sequestration at Old Rifle Site

FIU Year 4 Projected Scope

Perform geochemical
analysis using
Geochemist Workbench.



Conduct desorption
studies to investigate the
efficiency of uranium
removal at varying
environmental
conditions.

Task 2

Climate Resiliency Studies for Long-Term Surveillance of DOE- LM Sites



Task 2: Climate Resiliency Studies for Long-Term Surveillance of DOE-LM Sites

Site Needs

LM's disposal cells are designed to be effective for at least 200 years. However, in 2017 erosion was discovered in the Mexican Hat Disposal Cell in Utah.



Discovered Erosion

The erosion only manifested itself on the surface as slight depressions where the rock cover had subsided into the voids.

Objectives

- Develop non-invasive methods to investigate erosion features without risk of radiological exposure in case the radon barrier has been eroded.
- Correlate contributing causes to climate change.

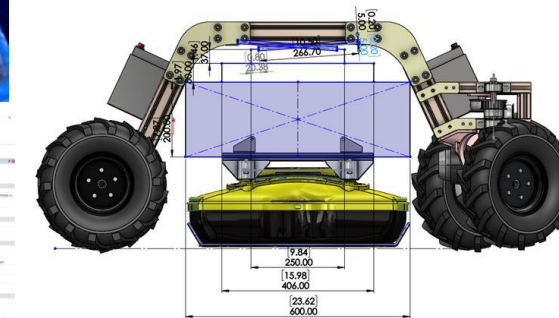
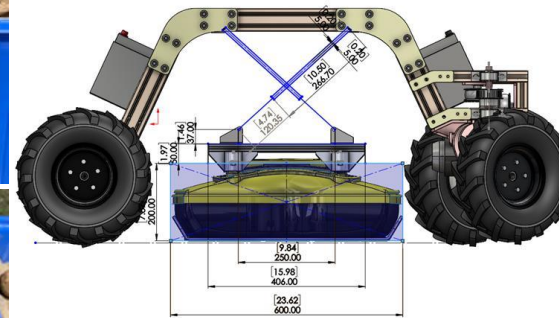
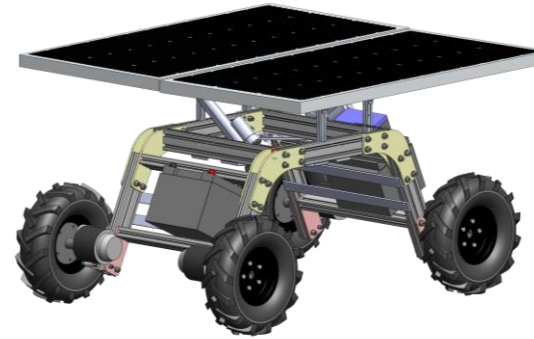
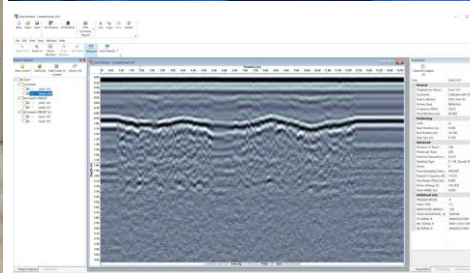


Mexican Hat Disposal Cell at Utah

Task 2: Climate Resiliency Studies for Long-Term Surveillance of DOE-LM Sites

FIU Year 3 Research Highlights and Accomplishments

A Ground Penetrating Radar was selected, tested, integrated into a robotic mobile platform, and deployed at LM's Mexican Hat Disposal Cell.



Task 2: Climate Resiliency Studies for Long-Term Surveillance of DOE-LM Sites

FIU Year 4 Projected Scope

Task 2.1: Sensor Integration and Data Analysis

- Continue streamlining the developed GPR autonomous mapping systems.
 - Increase the robotic platform TRL level.
 - Add independent suspension suitable for LM's cells.
 - Evaluate higher penetration GPR antennas.
 - Improve subsurface reconstruction & satellite image overlay algorithm.
 - Implement an organic operator interface considering feedback from LM site managers and field contractors received during the summer deployment.
- Deploy at LM's Disposal Cells and other DOE sites, including WIPP and Hanford.
- Analyze captured data during deployments.

Task 2.2: Extreme Event Characterization and Modeling **NEW**

- Develop hydrological model.
- Integrate drone and GPR observations.



Task 3

STEM Workforce Development - LM Fellows Selection



Task 3: STEM Workforce Development

FIU Year 3 Highlights & Accomplishments:

- 2 Fellows supported FIU scientists and engineers in the development of the technical work relevant to LM need
- DOE Fellow, Olivia Bustillo, participated and presented a poster at WM2023
- DOE Fellows and mentors met with DOE-LM collaborators and discussed project progress
- DOE Fellow, Shawn Cameron, participated in summer internship at Grand Junction and deployed GPR at various sites
- DOE Fellow, Olivia Bustillo Graduated with a Master's degree and joined UCOR

Congratulations to

These scholarships are awarded in memory of the late Dr. John P. O'Connell to students to develop careers in the safe and honor the Founder of the annual Wa

Olivia Bustillo, Florida International University
Lily Chen, Massachusetts Institute of Technology
Lucia Coello Poole, University of Nevada, Reno
Victoria Davis, Virginia Commonwealth University
Nicholas Espinal, Florida International University
Molly Friedman, Vanderbilt University



Task 3: STEM Workforce Development

FIU Year 4 Projected Scope

- Recruitment of qualified talented FIU minority STEM students
- Engage in DOE-LM research
- Poster exhibition & competition (November 2023)*
- Annual DOE Fellows induction ceremony (November 2023)*
- Summer internships 2024 / Site visits
- Summer internship technical reports
- Conference participation & presentations, including WM2024, AGU
- DOE Fellows lecture series forum





Thank You. Questions?