MORGAN RAINES

GRADUATE RESEARCHER

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EDUCATION

University of Mary Hardin-Baylor | 2018 - 2022

Bachelor of Science in Chemistry, Minors in Biology and Christian Studies, *summa cum laude,*

Advisor: Dr. Amy D. Millsap

Baylor University | 2022 - Present

Chemistry Ph.D. Student, Advisor: Dr. Julia Y. Chan (ORCiD)

EXPERIENCE

BAYLOR UNIVERSITY — *Waco, TX*

Graduate Researcher, Department of Chemistry and Biochemistry — Aug. 2022 – Present

Primary Investigator: Dr. Julia Y. Chan

- ◊ **Flux growth synthesis of lanthanide-containing intermetallic compounds** Synthesized single crystals as large as 3 mm x 4 mm x 1 mm of cerium manganese germanides via metallic flux.
- ◊ **Structural determination of intermetallic compounds** Solved single crystal structures of lanthanide manganese germanides under ambient conditions using single crystal X-ray diffraction with complementary methods of EDS and powder XRD. Determined structural details using Reitveld refinements.

UNIVERSITY OF MARY HARDIN-BAYLOR — *Belton, TX*

Undergraduate Researcher, Department of Chemistry — Jan. 2021 – May 2022

Faculty Advisor: Dr. Amy D. Millsap

- ◊ **Experimental procedures with *E. coli, B. cereus,* and *S. epidermidis*** Maintained, plated, and utilized these three strains of bacteria aseptically. Tryptic soy broth, Mueller-Hinton Agar, and classic Agar were used in these experiments.
- ◊ **Used UV-visible spectroscopy** Beer's law and UV-Vis were used to understand bacterial growth in the presence of disinfectant chemicals.
- ◊ **Developed polyvinyl alcohol films that dissolve in water at 25 °C** A specific ratio between the solid polyvinyl alcohol and its water solution are required to develop films that will dissolve in ambient temperature water.
- ◊ **Compared the efficacy of citric acid versus a quaternary ammonium compound (QAC)** By using disc diffusion techniques and surface inoculation, I was able to compare the popular and expensive QACs to readily available citric acid and investigate the efficacy of each chemical.

TEXAS A&M UNIVERSITY — *College Station, TX*

Laboratory Technician, Department of Entomology — June '21 – May '22

Supervisor: Lauren Beebe

- ◊ **Maintained six pesticide-resistant stable fly colonies** Assessed the health of the stable fly colonies and maintained nutrients, harvested eggs and pupae, and tracked egg production and generational stability so the flies could be used in further lab experiments exploring their pesticide resistance.
- ◊ **Assisted in the set up of a new laboratory** Ergonomically organized laboratory supplies, assembled structures, and set up various appliances such as -80 °C freezers, centrifuges, etc.

SKILLS

SYNTHESIS AND LABORATORY TECHNIQUES:

Solid State Synthesis – Arc-welding, flux growth, annealing, sealing quartz ampules using a H_2/O_2 torch.

Microbiological Processes - Colony growth and preservation. Aseptic transfer techniques. Autoclave usage

MAINTENANCE AND SERVICING:

Box furnaces, glove boxes, vacuum manifolds, vacuum pumps

X-RAY DIFFRACTION:

Single crystal X-ray diffraction (Bruker), powder X-ray diffraction (Bruker)

OTHER CHARACTERIZATION:

Energy dispersive X-ray spectroscopy (EDS), UV-visible spectroscopy

DATA PROCESSING:

Bruker APEX 4, SHELXL, SHELXT, Bruker TOPAS

COMPUTER BASICS:

Microsoft Suite, beginner Anaconda/Python/Spyder

TEACHING COMPETENCE

BAYLOR UNIVERSITY

Teaching Assistant

General Chemistry	Fall 2022
Introduction to Chemistry	Spring 2023

UNIVERSITY OF MARY HARDIN-BAYLOR

Teaching Assistant

General Chemistry	Spring, Fall 2019
College Chemistry	Fall 2019

PROVIDENCE PREPARATORY SCHOOL

Chemistry Tutor	Jan. ’21 – May ’22

PRESENTATIONS

POSTERS

UMHB Scholar's Day: *The Effects of Vitamin E on Skin Health: A Literary Research Project* | 2019

Faculty Sponsor: Dr. Ruth Ann Murphy

Topic: Exploring the antioxidant effects of vitamin E after damage from UV light and how vitamin E can be used to prevent skin melanomas as well as sun damage.

ACS San Diego 2022: *Capstone Research: Single Use Plastic Reduction and the Efficacy of Dehydrated Disinfectants* | 2022

Faculty Sponsor: Dr. Amy D. Millsap

Topic: Testing the antimicrobial properties of benzyldimethylhexadecylammonium chloride as well as citric acid and urea in combination against *E. coli, B. cereus,* and *S. epidermidis*. Since the chemicals are solid when dehydrated, they can be packaged as a solid and sold without a plastic bottle to be made into an aqueous solution at home. A water soluble PVA casing around the solid will allow for easy transport and storage.

ACS SWRM 2023: *A Polymorphism Study of Ce_2MnGe_6* | 2023

Faculty Sponsor: Dr. Julia Y. Chan

Topic: Arc-melted Ce_2MnGe_6 has been previously reported to adopt the orthorhombic Ce_2CuGe_6 structure type. Through our flux-growth and arc-melting techniques, Ce_2MnGe_6 has been successfully grown in both the previously reported orthorhombic structure (*Amm*2) and a new analogue of the monoclinic La_2AlGe_6 structure (*C*2/*m*). This study presents the synthesis, crystal growth, and structure determination for these two polymorphs *o*-Ce_2MnGe_6 and *m*-Ce_2MnGe_6, investigating the effects of synthesis on crystallization.

ORAL PRESENTATIONS

UMHB Scholars Day: *Capstone Research: Single Use Plastic Reduction and the Efficacy of Dehydrated Disinfectants* | 2022

Faculty Sponsor: Dr. Amy D. Millsap

Topic: Testing the antimicrobial properties of benzyldimethylhexadecylammonium chloride as well as citric acid and urea in combination against *E. coli, B. cereus,* and *S. epidermidis*. Since the chemicals are solid when dehydrated, they can be packaged as a solid and sold without a plastic bottle to be made into an aqueous solution at home. A water soluble PVA casing around the solid will allow for easy transport and storage.

PUBLICATIONS

BAYLOR UNIVERSITY

Brown, W.K; Plata, M.A.; **Raines, M.E.**; Chan, J.Y.* Structural and Physical Properties of $R_2M_3X_5$ Compounds. *Handbook of Physics and Chemistry of Rare Earths*, **2023**, *64*

UNIVERSITY OF MARY HARDIN-BAYLOR

Raines, M.E.; Millsap, A. D.* Single Use Plastic Reduction and the Efficacy of Dehydrated Disinfectants. *University of Mary Hardin-Baylor Honors Program Thesis,* **2022**

INSTITUTIONAL SERVICE

BAYLOR UNIVERSITY

Sample Preparation for Baylor's 2022 Advanced Instrumentation Workshop	Oct. 2022
Session Co-Leader in Baylor's 2023 Advanced Instrumentation Workshop	Oct. 2023

UNIVERSITY OF MARY HARDIN-BAYLOR

Resident Assistant	Aug. 2019 – Dec. 2019
Head Resident Assistant	Jan. 2020 – May 2022

HONORS AND AFFILIATIONS

BAYLOR UNIVERSITY — Aug '22 - Present

Officer in the Chemistry Graduate Student Association

Member of the BCU Scholars Program

Member of Present Your Ph.D.

Participant in Ramm Scholars Program

UNIVERSITY OF MARY HARDIN-BAYLOR — Aug '18 – May '22

UMHB Honors Program

Provost's Honor Roll – 7 semesters

Dean's Honor Roll – 1 semester

Vice President's Scholarship – must maintain a 3.5 or higher GPA

Leadership Scholarship – must maintain an active role on campus and demonstrate leadership among students.

2019 CRC Press Chemistry Achievement Award Recipient

Two-time Welch Foundation Departmental Undergraduate Research Grant recipient

Dr. Amy Levesconte Endowed Scholarship

Townsend Endowed Scholarship

Member of Gamma Sigma Epsilon, Xi Kappa chapter – Chemistry Honors Society

Undergraduate member of American Chemical Society

Officer in ACS certified UMHB Chemistry Club, Sigma Pi

Baylor University's Advanced Instrumentation Workshop 2021 attendee