SLATT UNDERGRADUATE RESEARCH FELLOWSHIP
FINAL REPORT

SCHOLAR NAME:	Grace Hsu
FACULTY ADVISOR:	Peter Burns
PROJECT PERIOD:	5/10-6/3 and 7/31-8/15
PROJECT TITLE:	Synthesis and Characterization of Uranyl Borosulfate Compounds and U(IV)/U(VI) Oxalate Compounds
CONNECTION TO ONE OR MORE ENERGY-RELATED RESEARCH AREAS (CHECK ALL THAT APPLY):	**( ) Energy Conversion and Efficiency (x) Sustainable and Secure Nuclear** **(x) Smart Storage and Distribution ( ) Transformation Solar** **( ) Sustainable Bio/Fossil Fuels ( ) Transformative Wind**

MAJOR GOALS AND ACCOMPLISHMENTS

Summarize your research goals and provide a brief statement of your accomplishments (no more than 1-2 sentences). Indicate whether you were able to accomplish your goals by estimating the percentage completed for each one. Use the next page for your written report.

RESEARCH GOALS	ACTUAL PERFORMANCE AND ACCOMPLISHMENTS	% OF GOAL COMPLETED
learn about uranyl borosulfate compounds	- learned about lab procedures and the scientific process in action including various synthesis methods -	70%
learn more about crystal picking and analyzing materials	- learned how to use single crystal x-ray diffractometer as well as powder diffractometer - began to analyze results and form crystal and compound structure	60%

RESEARCH OUTPUT

Please provide any output that may have resulted from your research project. You may leave any and all categories blank or check with your faculty advisor if you are unsure how to respond.

CATEGORY	INFORMATION
EXTERNAL PROPOSALS SUBMITTED	(Sponsor, Project Title, PIs, Submission Date, Proposal Amount)
EXTERNAL AWARDS RECEIVED	(Sponsor, Project Title, PIs, Award Date, Award Amount)
JOURNAL ARTICLES IN PROCESS OR PUBLISHED	(Journal Name, Title, Authors, Submission Date, Publication Date, Volume #, Page #s)
BOOKS AND CHAPTERS RELATED TO YOUR RESEARCH	(Book Title, Chapter Title, Authors, Submission Date, Publication Date, Volume #, Page #s)
PUBLIC PRESENTATIONS YOU MADE ABOUT YOUR RESEARCH	(Event, Presentation Title, Presentation Date, Location)
AWARDS OR RECOGNITIONS YOU RECEIVED FOR YOUR RESEARCH PROJECT	(Purpose, Title, Date Received)
INTERNAL COLLABORATIONS FOSTERED	(Name, Organization, Purpose of Affiliation, and Frequency of Interactions)
EXTERNAL COLLABORATIONS FOSTERED	(Name, Organization, Purpose of Affiliation, and Frequency of Interactions)
WEBSITE(S) FEATURING RESEARCH PROJECT	(URL)
OTHER PRODUCTS AND SERVICES (e.g., media reports, databases, software,	(Please describe each item in detail)

models, curricula, instruments, education programs, outreach for ND Energy and other groups)	

RESEARCH EXPERIENCE

Please let us know what you thought of your research experience: Did this experience meet your expectations? Were lab personnel helpful and responsive to your needs? What else could have been done to improve your experience or achieve additional results?

Overall, I had a really pleasant experience and because I worked with two grad students, there was

FINAL WRITTEN REPORT

(Please use the space below to describe your research project and objectives, any findings and results you can share, and graphs, charts, and other visuals to help us understand what you achieved as a result of this research experience.)

My main objective was to learn and familiarize myself with a lab, specifically one that is focused on actinide series chemical analysis and synthesis. One of the research projects that my graduate school mentor, Teagan Sweet, was working on was the bridging motifs of Uranyl Borosulfates, and I saw how uranyl as a countercation changed the shape of the Borosulfates into multiple hierarchies.

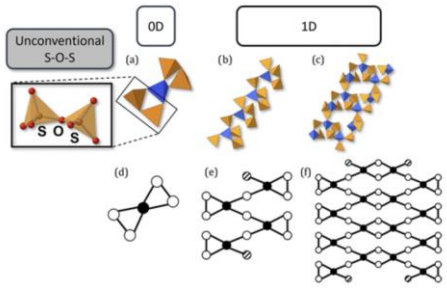

Figure 6. (a–c) Unconventional S–O–S borosulfate hierarchy. (d–f) Graphical notation of S–O–S borosulfates. Black circles represent borate tetrahedra, white circles represent sulfate tetrahedra, and striped circles represent the displayed pattern *ad infinitum*.

(from: https://doi.org/10.1021/acs.inorgchem.2c02144)

I also learned about thermochemistry working with my other graduate school mentor, Brodie Barth, and various calorimetry techniques, as well as synthesis methods of different compounds of U(IV)/U(VI) Oxalate Compounds that I am continuing to work on this semester. Overall, I learned more about the lab and actinide chemistry in action, which is not only useful in a scientific sense, but can apply to a variety of energy-related products and projects in a variety of different fields.