Amir Zarei

Curriculum Vitae

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Full Name: Amirhossein Zareihassangheshlaghi

RESEARCH EXPERIENCE

Florida State University, *Tallahassee, Fl* *Jan 2021 – Present*

Research Assistant

• Synthesize and charachterization of solid electrolytes for lithium ion batterie; halid-based and oxide-based solid electrolytes (SEs). (Discivered a novel halid-base SE with high performance: ≥0.8–1.0 mS cm^{-1}, ≥90% capacity retention at 2C).

• Prototyped cells in Ar glove box and studied solid-electrolyte interphase (SEI) by cell cycling, EIS and DQ/DV *(Publication in progress)*

• Metal-flux assisted crystal growth and structure optimization of magnesium-silicide-based thermoelectrics contains of alkaline and rare-earth metals (Ca, Eu, Sr, Ba, Yb).

• Structure–property–performance characterization by analytical techniques (SEM–EDX elemental mapping, PXRD, SCXRD, HR-TEM, magnetic measurement, and Rietveld refinement using GSAS-II and ShelXle).

• Crystal growth and structure optimization of semiconductor silicide compounds (comprising of alkaline and rare-earth metals) for thermoelectric applications. *(Resulted in 3 publications)*

• Mentored Research Experiences for Undergraduates (REU) students in crystal growth and characterization of intermetallic compounds.

National High Magnetic Field Laboratory, *Tallahassee, Fl* *Jul 2023 – Present*

Collaborator

• Evaluation of thermoelectric performance of semimetalic Zintl phases and high-entropy intermetallics using Physical Property Measurement System (PPMS).

• Characterization of intermetallic Zintl phase compounds with SEM-EDX and HR-TEM

HTE-Company (BASF SE Subsidiary), *Heidelberg, Germany* *May 2020 – Sep 2020*

Industrial Experience

• Synthesis of Au and Pd–Au intermetallic electrodes using high temperature synthesis methodes.

• Optimization of electrode geometry, electrode material, and cell configuration for cathodic corrosion synthesis with respect to final shape and size of nanoparticles.

• Synthesis of high-entropy nanoparticles for heterogeneous catalysis; performed advanced characterizations (HR-TEM, HR-SEM).

German Biomass Research Center (DBFZ), *Leipzig, Germany* *Jun 2019 – Nov 2019*

Research Assistant

• Study and simulation of the effect of refractory metal impurities on high-temperature combustion of silica-rich biomass assortments using phase-diagram software (FactSage).

• Chemical analysis of melting behavior of refractory phases using XPS, XRF, TGA/DSC, particle-size analysis, and ICP-OES.

Wilhelm-Ostwald Research Institute, *Leipzig, Germany* *Apr 2019 – Jun 2019*

Internship

• Compared and quantified concentration of refractory metal impurities on the surface of biomass-combusted ashes using XPS and Raman spectroscopy; studied refractory phases on rice husk ash surfaces.

EDUCATION

Ph.D. Candidate in Materials Chemistry and Inorganic *Jan 2022 – Present*
Florida State University

- *Metal-flux synthesis of high-entropy magnesium silicides.*
- *Synthesis and development of solid electrolytes for lithium-ion batteries.*

M.Sc. in Structural Chemistry and Spectroscopy *Apr 2017 – Nov 2020*
Universität Leipzig, Germany

- *Thesis: Synthesis of high-entropy intermetallic nanoparticles from electrochemical routs for heterogeneous catalysis.*

B.Sc. in Applied Chemistry *Sep 2011 – Nov 2016*
University of Tabriz, Tabriz, Iran

- *Thesis: Comparison of architectures and failure modes of oxide vs sulfide-electrolytes and composite cathodes, manufacturability and scale-up challenges*

PUBLICATION CONFERENCES

Publications:

1. **T**ej P. Poudel, **A. Zareihassangheshlaghi** (Co-First Author), Ifeoluwa P. Oyekunle, Pawan K. Ojha, Michael J. Deck, Erica Truong, Thilina N. D. D. Gamaralalage, Dewen Hou, Yan-Yan Hu. *E*ntropy Enhanced Mixed-halide Solid Electrolytes for Li-ion Batteries *(Under preparation)*

2. O. Araoyinbo,**A. Zareihassangheshlaghi**, M.S. Uddin, ,M. Ghafoor K. Wei, S.E. Latturner. *Thermoelectric and magnetic behavior of $(Eu/Yb/Mg)_2Si$ Zintl phases grown in magnesium-based flux [Submitted]*

3. **A. Zareihassangheshlaghi**, J. Galeano-Cabral, M.S. Uddin, B. Schundelmier, K. Wei, R.E. Baumbach, S.E. Latturner. *Synthesis of Zintl Phase Metal Silicide Thermoelectric Materials via Mg/Zn Flux.* **Inorg. Chem.** 2024, 63 (43), 20186–20196. [Link]

4. M.S. Uddin, **A. Zareihassangheshlaghi**, S.E. Latturner. *Temperature-Dependent Products in Gallium Flux Reactions of Cerium and Transition Metals.* **Inorg. Chem.** 2024, 63 (30), 13865–13874. [Link]

5. L. Marzano, M.S. Uddin, **A. Zareihassangheshlaghi**, J. Hernandez, S.E. Latturner. *Flux Growth of La_3MC_2 (M = Sb, Bi, Te).* **Z. Anorg. Allg. Chem.** 2025, 651 (10). [Link]

6. **A. Zareihassangheshlaghi**, H. Beidaghy Dizaji, T. Zeng, P. Huth, T. Ruf, R. Denecke, D. Enke. *Behavior of Metal Impurities on Surface and Bulk of Biogenic Silica from Rice Husk Combustion and the Impact on Ash-Melting Tendency.* **ACS Sustain. Chem. Eng.** 2020, 8 (28), 10369–10379. [Link]

Conferences:

Enhancing Thermoelectric Zintl Phases Through Site Mixing and High-Entropy Design. *Florida Annual Meeting and Exposition, Palm Harbor, USA, Sep 12 -14, 2025 (Oral).* [Link]

Enhancing Thermoelectric Zintl Phases Through Site Mixing and High-Entropy Design. *North American Solid State Chemistry Conference (NASSCC), Ames, USA, July 28–31, 2025 (Oral).* [Link]

Zintl Phase Metal Silicide Thermoelectric Materials. *American Chemical Society Spring 2024, New Orleans, USA, March 2024 (Oral).* [Link]

Evolution of Metal Impurities on Surface and in Bulk of Biogenic Silica from Rice Husk During Combustion. *28th European Biomass Conference & Exhibition, Marseille, France, April 2020 (Poster).*

Systematic Study of Most Relevant Parameters on the Quality of Biogenic Silica Obtained from Thermochemical Conversion of Rice Husk. *2nd Doctoral Colloquium Bioenergy, Nürnberg, Germany, October 2019 (Oral).*

Impact of Varying Heating Regimes on Biogenic Silica Obtained from Rice Husk. *1st German Doctoral Colloquium in Bioenergy, Leipzig, Germany, September 2018 (Oral & Poster).*

SKILLS

Languages: English (fluent), German (intermediate), Farsi (native).

Computer Knowledge: Microsoft Package, Matlab, Python, LaTeX.

Technical Software: ShelXle, GSAS-II, FactSage, TB-LMTO-ASA Package.

Analytical Techniques:

- Electrochemical techniques (EIS/CV/Chronoamperometry), X-ray diffraction techniques (Powder XRD, Single-Crystal XRD), Magnetic property measurement (SQUID), Gas sorption techniques (BET/BJH), Surface-sensitive techniques (XPS), (SEM-EDX, ICP-OES, XRF), Thermogravimetric analysis (TGA/DSC), Solid-state NMR (basic knowledge).

REFERENCES

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