

## Esther C. Hessong

SEM/FIB • materials characterization • (S)TEM • mechanical testing • manufacturing  
ehessong@uci.edu | <https://www.linkedin.com/in/esther-hessong/> | Albuquerque, NM

### Education

---

#### University of California, Irvine

Ph.D. Materials Science and Engineering

Expected September 2025

M.S. Materials Science and Engineering

March 2022

M.S. Chemistry

March 2020

#### University of California, Berkeley

December 2017

B.S. Chemistry, with Materials Chemistry concentration; minor in Mathematics and Science Education

### Experience

---

**Graduate Student Researcher** Rupert Lab, UC Irvine Materials Science & Engineering Jul 2020 – Present

- **Dissertation:** Tailoring amorphous grain boundary complexions in metallic nanocrystalline alloys.
  - Prepared bulk pellet samples using powder metallurgy techniques: air-free ball milling inside glovebox, consolidation (hot press) under vacuum, annealing and quenching procedures.
  - Quantified chemical partitioning across grain boundaries with STEM-EDS.
  - Measured variation in grain boundary thickness from STEM images and the resulting materials properties, such as deformation behavior with microcompression mechanical tests.
  - Postmortem analysis of micropillar plasticity, failure, and fracture.
- **Collaboration:** Fabricated bulk samples for mechanical testing, characterized sample fracture surfaces, and determined processing routes to increase plasticity of nanocrystalline Cu and Al alloys.
- **Equipment and Procedure Development:** Planned and constructed new vacuum encapsulation setup for annealing alloys, including determining safe location by coordinating with faculty and EH&S, installing hydrogen torch, ordering parts, repairing vacuum pump, and writing standard operating procedures.
- **Safety Representative:** Maintained equipment, trained users, and managed chemical inventory, 2020-23.
- **Selected Awards:**
  - **UC Office of the President and Lindau Nobel Laureate Meeting Committee** Young Scientist, 2025
  - **UCI Graduate Division** Public Impact Fellowship (\$10k), 2025
  - **Department of Energy Office of Science** Graduate Research Award (1 year funding), 2024-25
  - **UCI-LANL SoCal Hub** Fellowship (1 year funding), 2023-24

**Visiting Research Fellow** at the Center for Integrated Nanotechnologies (on-site) Jan 2024 – Present

- **Mentors:** Dr. Brad Boyce and Dr. Saryu Fensin
- Conceived and developed proposals to expand dissertation research with experiments conducted on-site and collaborations at Sandia and LANL through the DOE-SCGSR and SoCal Hub fellowships, respectively.
- LANL Collaboration (submitted to *Acta Materialia*): FIB lift-out and high-resolution TEM imaging and analysis of atomic steps along Sn twin boundary, for comparison to atomistic simulations.
- LANL Collaboration: Metallography and EBSD characterization of wrought and electroplated Ni before and after high impact testing; worked with technologists, postdocs, and staff for timely completion of the project report.

**Graduate Student Researcher** Corn Lab, UC Irvine Chemistry Feb 2019 – Jun 2020

- **Project 1:** Performed surface characterization (FTIR, XPS, AFM) of electrografted anilines on gold films (prepared vapor-deposited gold films and micro-electrochemical cells).
- **Project 2:** Using surface plasmon resonance imaging (SPRI) coupled to microfluidics, measured the in-situ generation, adsorption, and desorption of electrogenerated silver nanoparticles.

- Equipment and Procedure Development: Aligned FTIR platform for measurements on reflective surfaces.
- Safety Representative: maintained equipment, trained users, and managed chemical inventory.

## Undergraduate Student Researcher UC Berkeley

May 2016 – Dec 2017

- Project 1, Alivisatos Lab (Chemistry): Studied the pressure-induced phase transition of cesium lead bromide perovskite nanocrystals using a diamond anvil cell and home-built fluorescence microscope.
  - Synthesized nanocrystals using hot-injection method.
  - Measured particle size distribution from TEM images.
  - Developed MATLAB script to analyze peak shifts resulting from pressure changes.
- Project 2, Subramanian Lab (Electrical Engineering): Synthesized silver nanoparticles with different amine-based ligands to formulate conductive, printable inks to improve sintering of thin films.
  - Characterized electrical properties (4-point probe) and mechanical properties (profilometer)
- Awards:
  - **UC Office of the President** Undergraduate Research Ambassador (presented at state capitol), 2018
  - **Cal Alumni Association** Leadership Award (\$2.5k), 2017

## Technical Skills

- **Mechanical testing:** Microcompression with FemtoTools and Bruker Hysitron Systems
- **Scanning electron microscopy (SEM):** FIB lamella lift-outs and micropillar milling; EDS; EBSD
- **Transmission electron microscopy (TEM):** BF and DF imaging; EDS; aberration-corrected STEM
- **Laboratory:** Ball mill, furnace, air- and water-free techniques (Schlenk line, glove box), cryogenic systems
- **Additional characterization:** XRD, UV-Vis, FTIR, XPS, AFM
- **Computational:** MATLAB, ImageJ, Microsoft Suite, LaTeX

## Selected Conferences & Meetings

1. Materials Science & Technology 2024, Oral Presentation: "Thicker amorphous grain boundary complexions lead to increased plasticity in nanocrystalline copper alloys"
2. Center for Integrated Nanotechnologies User Meeting 2024, Poster: "Amorphous grain boundary complexions increase plasticity in nanocrystalline Cu alloys"
3. Minerals, Metals, & Materials Society 2023, Oral Presentation: "Variation of dopant distribution across amorphous complexions in nanocrystalline Cu-Zr-Nb and Cu-Zr-Nb-Ti"

## Publications

1. **E.C. Hessong\***, T. Lei\*, B. Fields, R.P. Thiriaux, B.L. Boyce, T.J. Rupert. "Amorphous complexion-aided sintering for scalable processing of bulk nanocrystalline Cu-Zr with high strength and compressive plasticity," submitted to Materialia. \*Authors contributed equally.
2. I. Chesser, M. Nitol, **E.C. Hessong**, H. Joshi, N. Admal, B. Runnels, D.N. Blaschke, A. Hunter, S. Fensin. "The structure and migration of twin boundaries in tetragonal beta-Sn: an application of machine learning based interatomic potentials," submitted to Acta Materialia.
3. T. Lei\*, **E.C. Hessong\***, B. Fields, R.P. Thiriaux, D.S. Gianola, T.J. Rupert. "Bulk nanocrystalline Al-rich alloys with amorphous complexions display high strength and compressive plasticity," submitted to Journal of Materials Science. \*Authors contributed equally.
4. T. Lei, **E.C. Hessong**, D.S. Gianola, T.J. Rupert. Binary nanocrystalline alloys with strong glass forming interfacial regions: Complexion stability, segregation competition, and diffusion pathways, Materials Characterization, (2023).
5. T. Lei, **E.C. Hessong**, J. Shin, D.S. Gianola, T.J. Rupert. Intermetallic particle heterogeneity controls shear localization in high-strength nanostructured Al alloys, Acta Materialia, (2022).
6. M. Qin, S. Shivakumar, T. Lei, J. Gild, **E.C. Hessong**, H. Wang, K.S. Vecchio, T.J. Rupert, J. Luo. Processing-dependent stabilization of a dissimilar rare-earth boride in high-entropy with enhanced hardness and grain boundary segregation, Journal of the European Ceramic Society, (2022).
7. Y. Fan, Y. Aceta, **E.C. Hessong**, A. Bengston, L. Biageyan, Q. Huynh, R.M. Corn. Complex resonant scattering behavior in the surface plasmon resonance imaging microscopy of single gold nanorods, The Journal of Physical Chemistry Letters, (2021).