Exponent®
Engineering & Scientific Consulting

Chelsea Liu, Ph.D., P.E.

Senior Engineer | Metallurgical and Corrosion Engineering
Menlo Park
+1-650-688-6719 | liuc@exponent.com

Professional Profile

Dr. Liu specializes in failure analysis, metallurgy, and materials characterization. Her technical expertise includes the understanding and operation of a variety of analytical tools, including scanning electron microscopy (SEM), focused ion beam (FIB), transmission electron microscopy (TEM), synchrotron-based and lab-based X-ray techniques (X-ray tomography, X-ray diffraction, and X-ray fluorescence), atom probe tomography (APT), differential scanning calorimetry (DSC), and mechanical testing techniques for structural, compositional, and thermal analysis of metals and polymers.

Dr. Liu also has experience in 2D image processing and 3D tomographic reconstruction using MATLAB, ImageJ, Paraview, and Vaa3D.

Prior to joining Exponent, Dr. Liu completed her Ph.D. in the Department of Materials Science and Engineering at the University of Illinois at Urbana-Champaign (UIUC). Her doctoral thesis focused on characterizing the structural and chemical properties of shear bands in metallic glasses from the atomic scale to the microscale. Her experimental findings linked the structural evolution of shear bands with the macroscopic plastic strain in metallic glasses. For her dissertation work, Dr. Liu also collaborated closely with staff scientists from the Advanced Photon Source at Argonne National Laboratory and Oak Ridge National Laboratory.

In addition to her dissertation work, Dr. Liu served as a teaching assistant for undergraduate materials laboratory classes and the Thermal and Mechanical Properties of Materials class. Her undergraduate research project included assembling and characterizing water desalination membranes and hybrid solar cells. Dr. Liu also performed an internship at Schlumberger where she conducted structure-property analyses of additively manufactured Ni-based superalloys.

Academic Credentials & Professional Honors

Ph.D., Materials Science and Engineering, University of Illinois, Urbana-Champaign, 2020

B.S., Materials Science and Engineering, Massachusetts Institute of Technology (MIT), 2015

Jill Hruby Fellowship Finalist, Sandia National Laboratories, 2020

Racheff Teaching Fellowship, UIUC, 2017-2019

Donald Hamer Fellowship, UIUC, 2015-2017

Licenses and Certifications

Professional Engineer Metallurgical, California, #2046

Professional Affiliations

Society of Engineering Science (SES)

The Minerals, Metals & Materials Society (TMS)

Society of Women Engineers (SWE)

Tau Beta Pi (TBP)

Publications

Liu C, Hudgins A, James B. Failure Analysis of a Ruptured Pipeline. Journal of Failure Analysis and Prevention 2024.

Maragh J, Liu C, Martin P, Switzner N, Gibbs J, Kornuta J, Veloo P. Reducing bias in chemical composition data with measurements below the limit of detection. Pipeline Pigging and Integrity Management Conference (PPIM), 2022.

Das A, Derlet PM, Liu C, Dufresne E, Maass R. Stress breaks universal aging behavior in a metallic glass. Nature Communications 2019; 10:5006.

Liu C, Das A, Wang W, Küchemann S, Kenesei P, Maass R. Shear-band cavities and strain hardening in a metallic glass revealed with phase-contrast x-ray tomography. Scripta Materialia 2019; 170:29-33.

Liu C, Cai Z, Xia X, Roddatis V, Yuan R, Zuo JM, Maass R. Shear-band structure and chemistry in a Zr-based metallic glass probed with nano-beam x-ray fluorescence and transmission electron microscopy. Scripta Materialia 2019; 169:23-27.

Liu C, Maass R. Elastic fluctuations and structural heterogeneities in metallic glasses. Advanced Functional Materials 2018; 28:1800388. (Invited Feature Article)

Küchemann S, Derlet PM, Liu C, Rosenthal D, Sparks G, Larson WS, Maass R. Energy storage in metallic glasses via flash-annealing. Advanced Functional Materials 2018; 28:1805385.

Küchemann S, Liu C, Dufresne E, Shin J, Maass R. Shear banding leads to accelerated aging dynamics in a metallic glass. Physical Review B 2018; 97:014204.

Liu C, Roddatis V, Kenesei P, Maass R. Shear-band thickness and shear-band cavities in a Zr-based metallic glass. Acta Materialia 2017; 140:206-216.

Tyler KI, Li Y, Jackson ND, Chen W, Liu C, Bhargava R. Overcoming difficulties in research statement preparation for the academic job search: expansion of a peer-focused professional development program. ASEE Annual Conference and Exposition 2017.

Jackson ND, Tyler KI, Li Y, Chen W, Liu C, Bhargava R. Keeping current: an update on the structure and evaluation of a program for graduate women interested in engineering academia. ASEE Annual Conference and Exposition 2017.

Kovacs JR, Liu C, Hammond PT. Spray layer-by-layer assembled laponite clay composite thin films as selective layers in reverse osmosis membranes. ACS Materials and Interfaces 2015; 7:13375-13383.

Presentations

Liu C, Davis C, Hudgins A, Neilson H, Ortiz J. Enhanced Inspections and Technology for Wildfire Mitigation of Transmission Assets. Centre for Energy Advancement through Technological Innovation

(CEATI) Conference, 2022.

Liu C, Das A, Küchemann S, Kenesei P, Cai Z, Roddatis V, Maass R. Shear-band structure: micron-size cavities, chemistry, and nanoscale density change. SES 56th Annual Technical Meeting, St. Louis, MO, 2019.

Liu C, Roddatis V, Kenesei P, Maass R. Shear-band thickness and cavitation in a Zr-based metallic glass. TMS 147th Annual Meeting & Exhibition, Phoenix, AZ, 2018.

Liu C, Roddatis V, Kenesei P, Maass R. Shear-band thickness and cavities in a metallic glass. 3rd Annual Midwest Workshop on Mechanics of Materials and Structures, West Lafayette, IN, 2017. (2nd place graduate research presentation award)