

Exponent®
Engineering & Scientific Consulting

Melissa Frey, Ph.D.

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Professional Profile

Dr. Frey specializes in civil engineering design, analysis, and construction. She has particular expertise in the analysis and characterization of novel materials for pavements and buildings. In particular, Dr. Frey has specialized expertise in experimental design and laboratory testing of civil engineering materials and novel materials inspired by nature (“bio-inspired” materials) which are intended as sustainable, low-carbon alternatives to conventional construction materials. She has professional experience in quality assurance material testing, inspecting the installation of construction components to ensure conformance to engineered design and applicable code, and analyzing construction defects related to building envelope performance.

Dr. Frey’s dissertation evaluated biologically-produced polymers (known as biopolymers) for use as material alternatives for conventional asphalt pavements which rely on petroleum-based binding agents. Through this research, she established a collaboration with the Colorado Department of Transportation (CDOT) to perform material characterization in the Bituminous Materials Laboratory, which is part of CDOT’s Asphalt Pavement Program. Dr. Frey conducted mechanical, rheological, spectroscopy, and microscopy characterization using load frame systems, dynamic shear rheometry, fourier transform infrared testing (FTIR), and X-ray computed tomography (XCT), respectively. Additionally, her work modeled and characterized the hygrothermal and diffusion behavior of biopolymer materials and composites.

During her graduate studies at the University of Colorado Boulder, Dr. Frey was a teaching assistant for undergraduate courses including building systems and materials and structural analysis. Prior to her graduate studies, Dr. Frey worked as an intern in design and field engineering positions for private and government operated engineering firms in Alaska, Colorado, and California. She has professional experience in arctic engineering, highway and road design, and conducting forensic field investigations related to building enclosures, water resistive barriers, flooring, and cladding.

Academic Credentials & Professional Honors

Ph.D., Civil Engineering, University of Colorado, Boulder, 2023

M.S., Civil Engineering, University of Colorado, Boulder, 2020

B.S., Civil Engineering, University of Alaska, 2018

Graduate Assistance in Areas of National Need (GAANN) Fellow

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Prior Experience

Building Technology Technical Intern, Simpson Gumpertz & Heger (SGH), Summer 2022

Transportation Design Intern, Hattenburg Dilley & Linnell (HDL), 2017-2018

Field Engineer Intern, Alaska Department of Transportation & Public Facilities Construction Sector, Summer 2016 & 2017

Materials Design Intern, Alaska Department of Transportation & Public Facilities Central Materials, 2016-2017

Professional Affiliations

American Society of Civil Engineers (ASCE)

American Concrete Institute (ACI)

Publications

Frey MR, Williams SL, Torres-Machi C, Srubar WV. Biobased alternative binders from agar for civil engineering applications: Thermal, biodeterioration, and moisture sorption properties. International Conference on Biobased Materials (ICBBM) Springer Proceedings 2023, 665-675.

Presentations

Frey MR, Williams SL, Torres-Machi C, Srubar, WV. Biobased alternative binders from agar for civil engineering applications: Thermal, biodeterioration, and moisture sorption properties. Oral presentation, 5th International Conference on Bio-Based Building Materials, Vienna, Austria, 2023.

Frey MR, Williams SL, Torres-Machi C, Srubar, WV. Agar-Based Binder Materials for Flexible Pavement Applications. Poster presentation, 101st Annual Transportation Research Board Meeting, Washington DC, 2022.

Frey MR, Williams SL, Torres-Machi C, Srubar, WV. Biobased Alternative Asphalt Binders from Agar: Baseline Properties and Future Directions. Oral presentation, ASCE International Airfield & Pavements Conference, Virtual, 2021.

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