

Exponent®
Engineering & Scientific Consulting

Casey Davis, Ph.D., P.E.

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Professional Profile

Dr. Davis is a metallurgical engineer who specializes in material processing, microstructural development, and materials characterization of conventional and nanostructured metal alloys. During her time at Exponent, she has worked on a wide range of projects in the utilities, medical device, consumer electronics, and automotive industries. Dr. Davis has substantial expertise in the asset management of electrical and gas utilities, with a primary focus on inspection practices, risk analysis, and quality control programs. She has extensive experience with a variety of materials characterization techniques including metallography, optical microscopy, scanning electron microscopy (SEM), focused ion beam (FIB), transmission electron microscopy (TEM), x-ray techniques (XRD, SAXS, WAXS, XRF, XLPA) as well as mechanical testing techniques.

Before joining Exponent, Dr. Davis completed her graduate studies at the Colorado School of Mines, where her dissertation focused on controlling microstructural evolution of magnesium alloys for bioabsorbable cardiovascular stents by inducing high shear deformation. Her work included high shear processing of magnesium, energy dispersive spectroscopy (EDS), electron backscatter diffraction (EBSD), transmission Kikuchi diffraction (TKD), and x-ray diffraction (XRD) with x-ray line profile analysis (XLPA).

During her graduate research, she also gained experience in failure analysis and characterization of a wide range of different metals and their applications. Examples of the projects she collaborated on include: nanostructured titanium bone screws, stainless steel cannula, nanostructured aluminum for conductors, and nanostructured copper.

Academic Credentials & Professional Honors

Ph.D., Material Science, Colorado School of Mines, 2019

B.S., Metallurgical and Materials Engineering, Colorado School of Mines, 2014

Licenses and Certifications

Professional Engineer Metallurgical, Colorado, #0067867

Prior Experience

Senior Research Assistant, Colorado School of Mines, 2014-2019

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Publications

Davis, C.F., Griebel, A.J. & Lowe, T.C. Isothermal Continuous Equal Channel Angular Pressing of Magnesium Alloy AZ31. JOM 72, 2603–2611 (2020). https://doi.org/10.1007/s11837-020-04195-4

Laszlo S. Toth, Viet Q. Vu, Satyaveer Singh Dhinwal, Yajun Zhao, Roxane Massion, Cai Chen, Casey F. Davis, Terry C. Lowe. The mechanics of High Pressure Compressive Shearing with application to ARMCO® steel, Materials Characterization, Volume 154, 2019, Pages 127-137. https://doi.org/10.1016/j.matchar.2019.05.039.

Meagher, R.C. Hayne, M.L., DuClos J., Davis, C.F., Lowe, T.C., Ungar, T. Arfaei, B. Increasing the Strength and Electrical Conductivity of AA6101 Aluminum by Nanostructuring. In: Chesonis, C. (eds) Light Metals 2019. The Minerals, Metals & Materials Series. Springer, Cham. https://doi.org/10.1007/978-3-030-05864-7_190.

T.C. Lowe, C.F. Davis, P.M. Rovira, M.L. Hayne, G.S. Campbell, J.E. Grzenia, P.J. Stock, R.C. Meagher, H.J. Rack,. Scientific and Technological Foundations for Scaling Production of Nanostructured Metals. IOP Conf. Ser.: Mater. Sci. Eng. 194 012005. DOI 10.1088/1757-899X/194/1/012005

Radim Kocich, Lenka Kunčická, Casey F. Davis, Terry C. Lowe, Ivo Szurman, Adéla Macháčková, Deformation behavior of multilayered Al–Cu clad composite during cold-swaging, Materials & Design, Volume 90, 2016, Pages 379-388. https://doi.org/10.1016/j.matdes.2015.10.145.

Lenka Kunčická, Terry C. Lowe, Casey F. Davis, Radim Kocich, Martin Pohludka, Synthesis of an Al/Al2O3 composite by severe plastic deformation, Materials Science and Engineering: A, Volume 646, 2015, Pages 234-241. https://doi.org/10.1016/j.msea.2015.08.075.

L. Kuncicka, M. Pohludka, T.C. Lowe, C.F. Davis, J. Jurica, L. Hlavac, Intensive plastic deformation of pre-sintered Al powder, Metal 2015, 24th Intl Conf on Metallurgy and Materials, 3-5 June 2015, Brno, Czech Republic, Tanger Ltd., 2015, 247-252.

T.C, Lowe, L. Kuncicka, R. Kocich, C.F. Davis, L. Hlavac, J. Dvorak, The influence of consolidation procedure parameters on compaction of Al powder Metal 2015, 24th Intl Conf on Metallurgy and Materials, 3-5 June 2015, Brno, Czech Republic, 1352-1357.

Presentations

Davis CF, Thurston KVS, Dunne R, Didyk M, Simhadri A. Correlation of Adverse Seasonal Weather Effects with Asset Failure Rates. 2024 CEATI Transmission & Distribution Conference, Palm Springs, CA, 2024.

Liu C, Davis CF, Hudgins A, Neilson H, Ortiz J. Enhanced Inspections and Technology for Wildfire Mitigation of Transmission Assets. 2022 CEATI Transmission & Distribution Conference, Atlanta, GA, 2022.

Project Experience

Utilities

Dr. Davis has experience in electrical and gas utilities with a primary focus on asset management including inspection practices, risk analysis, and quality control programs. Some examples of Dr. Davis's utility work include:

- Developing a program to maintain systemwide consistency of inspection results and maintenance prioritization of transmission electrical assets.

- Performing incident investigations of electrical assets including reviewing direct and root causes of failures to ascertain the extent of an asset's condition and potential system risks.
- Working with asset management groups of electrical utilities to build effective inspection and maintenance programs to reduce the risk associated with asset failures resulting in ignition, public safety, and/or reliability events.
- Performing root cause analysis of errors associated with gas leak documentation and reporting.
- Conducting analysis of pipe and turbine failures.

Medical Devices

Dr. Davis has experience working with medical devices in all stages of the product lifecycle. This includes, but is not limited to, materials selection, manufacturing and process development, performance testing, and device failure analysis. Specific project examples include:

- Helping design a nano-structure processing technique of bioabsorbable magnesium for orthopedic implants and cardiovascular stents.
- Solving corrosion and contamination issues during manufacturing of stainless-steel cannula.
- Conducting failure analysis of laparoscopic tubes that experienced issues due to residual stresses created during the manufacturing process.
- Performing fatigue and wear testing of cardiovascular stents.
- Conducting failure analysis of titanium spine rods and screws.