Exponent®
Engineering & Scientific Consulting

Ty Porter, Ph.D., P.E.

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Professional Profile

Dr. Porter's broad areas of technical expertise include physical and mechanical metallurgy, failure analysis, corrosion, fracture mechanics, materials characterization, and microstructure-property relationships.

Dr. Porter has a Ph.D. in Metallurgical and Materials Engineering and a B.S. in Mechanical Engineering, both from the Colorado School of Mines. His expertise includes heat treatment, microstructural development, mechanical testing, high-temperature mechanical properties, fatigue, and advanced materials characterization methods. He has experience in a range of industries and applications including oil and gas pipelines, petrochemical and chemical production facilities, gas turbine power plants, and consumer products where he applies fundamental engineering principles and best engineering practices to direct and root cause analyses. Dr. Porter also has extensive casting, manufacturing, and product design knowledge and experience in aerospace and mining industries.

Dr. Porter has experience designing and conducting testing to assess consumer product safety and the need for a potential recall. Similarly, Dr. Porter has conducted several consumer product risk assessments for failed products, including recreational equipment, electronic devices, and appliances, to help clients make informed recall decisions. Additionally, Dr. Porter has carried out and advised on several large-scale organizational assessments of product safety and regulatory compliance programs for clients with a range of products and business models.

Prior to joining Exponent, Dr. Porter conducted his Ph.D. work at the Colorado School of Mines (CSM) in the Advanced Steel Processing and Products Research Center (ASPPRC). His research focused on the effects of microstructural evolution on creep-fatigue deformation and damage mechanisms of an advanced structural 25Ni-20Cr austenitic stainless steel (Alloy 709) for use in next generation (Gen-IV) nuclear reactor applications. The research included phase modeling using Thermo-Calc software, microstructural development through heat treatments, low-cycle fatigue and creep-fatigue testing, and microstructural characterization using light optical microscopy (LOM), scanning electron microscopy (SEM), transmission electron microscopy (TEM), X-ray diffraction (XRD), and small-angle neutron scattering (SANS). Dr. Porter's research included domestic collaboration with the Idaho National Laboratory (INL) and international collaboration with the Australian Nuclear Science and Technology Organisation (ANSTO).

Prior to graduate research, Dr. Porter worked in new product development at ESCO Corp. During his time there, he helped develop two patented steel casting designs from ideation to production, which included extensive CAD modeling with Unigraphics, dynamic finite element modeling (FEM) using LS-DYNA, prototype and production casting tool design, developing and managing manufacturing processes, laboratory testing, fixture design, and field trial support in Brazil. Dr. Porter also worked in new product

development at Precision Castparts Corp., where he optimized investment casting designs and processes for aeroengine and industrial gas turbine components.

Academic Credentials & Professional Honors

Ph.D., Metallurgical and Materials Engineering, Colorado School of Mines, 2019

B.S., Mechanical Engineering, Colorado School of Mines, 2012

Licenses and Certifications

NACE Certified Corrosion Technician

Prior Experience

Design Engineer 2, New Product Development, ESCO Corp., 2013–2015

Engineer, Technical Rotation Program, PCC Structurals, Inc., 2012–2013

Professional Affiliations

ASM International, Failure Analysis Society (FAS)

The Association for Materials Protection and Performance (AMPP)

Patents

Porter TD, Roska MB, Durand SD. Hammer for material reducing machines. US patent US20150314298A1.

Roska MB, Porter TD, Durand SD. Hammer for material reducing machines. US patent US10525477B2.

Publications

Porter TD, Wang Z, Gilbert EP, Kaufman MJ, Wright RN, and Findley KO. Microstructure evolution of alloy 709 during static-aging and creep-fatigue testing. Materials Science and Engineering A 2021, 801.

Porter TD. The effects of microstructural evolution on deformation and damage mechanisms during creep-fatigue testing of Alloy 709. Ph.D. dissertation, Colorado School of Mines, Golden, CO, 2019.

Porter TD, Findley KO, Kaufman MJ, Wright RN. Assessment of creep-fatigue behavior, deformation mechanisms, and microstructural evolution of Alloy 709 under accelerated conditions. International Journal of Fatigue 2019, 124:205–216.

Porter T, Findley K, McMurtrey M. Assessment of creep-fatigue behavior of Alloy 709. Transactions of American Nuclear Society 2017, 117:559–562.

Carter A, Porter T, Findley KO, Kaufman MK. Time temperature precipitation diagram and qualitative validation for Alloy 709. Transactions of American Nuclear Society 2017, 117:638–641.

Presentations

Porter T, Slone C, and James B. Surface Discontinuities and Fatigue Performance. Presentation, ASM IMAT, Detroit, MI, 2023.

Porter T, Lemberg J, and Guyer E. Fall-Prevention Device Shoulder Bolt Failure. Presentation, ASM IMAT, Detroit, MI, 2023.

Porter T, Tucker J, Davis B, Getsinger D, and Kornuta J. Best Practices for Root Cause Analysis in the Context of a Potential Dispute. Presentation, Western Turbine Users Inc. (WTUI) Conference, San Diego, CA, 2023.

Kirchhofer R, Porter T, and Kennett S. Torsional Failures in Hollow Axle Shafts from an F1000 Race Car. Presentation, ASM IMAT, New Orleans, LA, 2022.

Porter T, Findley K, Kaufman M, Wright R. Evolution of microstructure, deformation mechanisms, and internal damage during creep-fatigue testing of Alloy 709 (Fe-20Cr-25Ni). Materials Science and Technology Conference, 2019.

Porter T, Findley K, Song J, Kaufman M. Assessment of creep-fatigue behavior and damage mechanisms of Alloy 709 under accelerated conditions. Materials Science and Technology Conference, 2017.