Exponent®
Engineering & Scientific Consulting

Meredith Sellers, Ph.D., P.E., CEng

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Professional Profile

Meredith Sellers, Ph.D., P.E., CEng, is a principal in Exponent's Metallurgical & Corrosion Engineering practice with over 15 years of experience in materials performance, asset integrity, process reliability, and failure analysis. She specializes in damage mechanisms affecting process piping and vessels, integrity management, industrial process facility investigations, and expert witness litigation and arbitration support across oil and gas, chemical processing, and consumer products industries.

Dr. Sellers provides process-driven failure analysis and integrity management services, helping clients understand how system design, materials selection, and operating conditions interact to support reliability and safety across complex industrial operations. Her work often focuses on the interplay between operating conditions and the performance of systems, piping, equipment, and products. As a Licensed Professional Chemical Engineer, Chartered Chemical Engineer, and NACE Certified Corrosion Technician, she combines practical knowledge of real-world processes with a rigorous understanding of industry standards (API, NACE, ASME) to deliver actionable insights that help clients prevent failures and improve operations.

Dr. Sellers is a long-standing member of the Society of Women Engineers (SWE) and the Association for Women in Science (AWIS), and she is an active participant in community science, technology, engineering, and mathematics outreach activities. She currently serves as the Co-Chair of the Equal Representation for Expert Witnesses (ERE) initiative.

Oil & Gas Facility Failure Analysis and Integrity Management

Dr. Sellers has investigated failures and performance issues at refineries, offshore platforms, and liquefied natural gas (LNG) facilities. She focuses on damage mechanisms (e.g., corrosion, stress corrosion cracking, hydrogen embrittlement) affecting process piping and vessels from a chemical engineering perspective, including the evaluation of operating temperatures, pressures, and process fluids. She has led root-cause investigations of units and equipment such as reactors, heaters, heat exchangers, separators, pressure vessels, pumps, turbines, gaskets, valves, and analyzers/indicators/gauges.

She has also assisted operators and owners in assessing integrity management programs, including inspection practices, damage mechanism reviews, and fitness-for-service evaluations. Her work regularly requires analysis of process flow diagrams (PFDs), piping and instrumentation diagrams (P&IDs), and inspection isometrics. She draws on her Certified Risk Based Inspection Professional (API 580) and NACE Certified Corrosion Technician credentials, as well as her extensive experience with federal and international code requirements and industry standards pertinent to process piping and natural gas utilities.

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Industrial Process Facility Investigations

Dr. Sellers has extensive experience evaluating systems, piping, and equipment in industrial process facilities including those used for pharmaceuticals and polymers manufacturing, medical device sterilization, fertilizer and food production and storage, and biowaste processing, among others. She has investigated failures at large- and small-scale facilities, including those resulting in loss of containment events. She also assists clients who are designing and updating facilities with material selection questions and challenges.

Consumer Product and Medical Device Materials Issues

Using her familiarity with materials characterization techniques, Dr. Sellers assists consumer products and medical device clients in investigating potential issues identified during design, manufacturing, testing, and use. She routinely consults on materials selection and performance, contamination analyses, process development and validation, extractable and leachable assessments, and product reliability evaluations and recalls.

Semiconductor Manufacturing and Thin-Film Characterization

Dr. Sellers leverages her thin-film synthesis and characterization background to help troubleshoot issues with integrated circuit fabrication equipment and semiconductor manufacturing processes. She has investigated the impacts of process upsets on tool integrity as well as failures of furnaces, deposition chambers, implanters, vacuum pumps, and etching systems. She has experience reviewing process documentation for historical and modern semiconductor manufacturing operations to inform toxicological and environmental assessments.

Expert Witness Support and Testifying Experience

Dr. Sellers has served as an expert witness in U.S.-based litigation and international arbitration matters involving materials failures, oil and gas projects, infrastructure and equipment, and industrial process facilities. She has been designated as an expert in state and district court in the U.S., as well as arbitrations pursuant to International Chamber of Commerce (ICC), UNCITRAL, London Court of International Arbitration (LCIA), and AIDA Reinsurance and Insurance Arbitration Society (ARIAS) rules.

Professional Background

Before joining Exponent, Dr. Sellers was a postdoctoral researcher at the U.S. Army Engineer Research and Development Center – Construction Engineering Research Laboratory (ERDC-CERL), where she developed and evaluated carbon nanotube, graphene, and metal oxide-based supercapacitors. Her doctoral thesis research at the University of Illinois at Urbana–Champaign (UIUC) focused on the chemical vapor and atomic layer deposition (CVD/ALD) of titanium dioxide and the optimization of its electrical properties for photocatalysis and supported metal catalysis. This entailed the extensive use of materials characterization techniques such as X-ray diffraction (XRD), X-ray photoelectron spectroscopy (XPS), and scanning electron microscopy/energy dispersive X-ray spectroscopy (SEM/EDS).

Before entering graduate school, Dr. Sellers held research appointments in the Micro-Total-Analytical Systems and Entry Control & Contraband Detection Technologies organizations at Sandia National Laboratories and in the Department of Chemistry at University College London.

Academic Credentials & Professional Honors

Ph.D., Chemical Engineering, University of Illinois, Urbana-Champaign, 2011

M.S., Chemical Engineering, University of Illinois, Urbana-Champaign, 2008

B.S., Chemical Engineering, Cornell University, 2005

Harry G. Drickamer Research Fellowship, UIUC 2009-2010

National Science Foundation Graduate Research Fellowship 2006-2009

BP Fellow, UIUC 2005-2006

Licenses and Certifications

Professional Engineer Chemical, California, #6642

Professional Engineer, Colorado, #PE.0053689

Professional Engineer, Illinois, #062.077144

Professional Engineer Chemical, Minnesota, #52321

Professional Engineer, Pennsylvania, #PE098186

Professional Engineer Chemical, Texas, #163322

OSHA 24-Hour HAZWOPER Certificate

8-Hour HAZWOPER Annual Refresher

Certified Risk Based Inspection Professional, American Petroleum Institute, API 580

NACE Certified Corrosion Technician

Prior Experience

ORISE Postdoctoral Program Participant, US Army Engineer Research and Development Center, Construction Engineering Research Laboratory, 2011-2012

Graduate Research Assistant, University of Illinois at Urbana-Champaign, Department of Chemical and Biomolecular Engineering, 2005-2011

Instructional Laboratory Developer and Teaching Assistant, University of Illinois at Urbana-Champaign, Department of Chemical and Biomolecular Engineering, 2006-2009

Student Intern, Sandia National Laboratories, 2004, 2005

Honorary Research Associate, University College London, Department of Chemistry, 2003

Professional Affiliations

American Institute of Chemical Engineers

Materials Research Society

Society of Women Engineers

Association for Women in Science

Association for Materials Protection and Performance

Languages

French (France)

Patents

Marsh CP, Sellers MCK, Zussblatt NP. Polymer Supercapacitor and Method of Manufacture. U.S. Patent Number 9,922,776 B2, March 20, 2018.

Marsh CP, Pagan-Vazquez A, Feickert CA, Averbuch A, Sellers MCK, Foster CJ, Lux SM, Hesterberg J, Friedl A, Magerko JA. Fluid Generator System. U.S. Patent Number 10,256,698 B2, April 9, 2019.

Publications

Slone CE, Sellers MCK, Caligiuri RD, Latanision RM, Barrett Z, Engel C. "Environmentally assisted cracking resistance of 7xxx-series aluminum alloys in chloride-rich environments compared to humid air." Corrosion Science 2026; 270:114069.

Sellers MCK, Seebauer EG. "Persistent illumination-induced changes in polycrystalline TiO_2 majority carrier concentration." Materials Letters 2016; 162:20-23.

Sellers MCK, Seebauer EG. "Room temperature ferromagnetism in Mn-doped TiO_2 nanopillar matrices." Materials Letters 2014; 114:44-47.

Sellers MCK, Castle BM, Marsh CP. "Three-dimensional manganese dioxide-functionalized carbon nanotube electrodes for electrochemical capacitors." Journal of Solid State Electrochemistry 2013; 17:175-182.

Sellers MCK, Seebauer EG. "Investigation of nanostructured TiO2 surface and interface electric fields with photoreflectance spectroscopy." AIChE Journal 2013; 59:1049-1055.

Sellers MCK, Zussblatt NP, Marsh CP. "Potassium perruthenate-treated carbon nanotube sheets for flexible supercapacitors." Electrochemistry Communications 2012; 18:58-61.

Sellers MCK, Seebauer EG. "Manipulation of polycrystalline TiO2 carrier concentration via electrically active native defects." Journal of Vacuum Science & Technology A 2011; 29:061503.

Sellers MCK, Seebauer EG. "Structural and magnetic properties of Mn-doped anatase TiO2 films synthesized by atomic layer deposition." Applied Physics A 2011; 104:583-586.

Sellers MCK and Seebauer EG. "Measurement method for carrier concentration in TiO2 via the Mott–Schottky approach." Thin Solid Films 2011; 519:2103-2110.

Invited Reviews

Seebauer EG, Kratzer MC. Charged point defects in semiconductors. Materials Science and Engineering: R 2006; 55:57-149.

Books

Seebauer EG, Kratzer MC. Charged Semiconductor Defects: Structure, Thermodynamics, and Diffusion. Engineering Materials and Processes Series, London, Springer-Verlag, 2009.

Published Proceedings

Lux S, Foster CJ, Sellers MCK, Friedl AP, Feickert C, Hesterberg J, Marsh CP. Generative textiles for non-rotary power production from wind. ASME 6th International Conference on Energy Sustainability Proceedings, 2012; 44816, Parts A and B:1415-1422.

Sellers MCK, Zussblatt N, Friedl AP, Marsh CP. Design of flexible supercapacitors using metal oxide-decorated carbon nanotube sheet. Materials Research Society Symposium Proceedings, 2012; 1388:mrsf11-1388-f14-02.

Sellers MCK, Friedl AP, Lux S, Feickert C, Hesterberg J, Morefield S, Marsh CP. Conductive textiles for non-rotary electrical generation from wind. US Army Corps of Engineers Research and Development Conference Proceedings, 2011.

Non-Refereed Journal Articles

Sellers, MCK In: Revisiting the future of chemical engineering. Westmoreland PR and C McCabe (eds), Chemical Engineering Progress 2018; 114 (10): 26-38.

Kratzer MC In: Chemical engineering in the next 25 years. Westmoreland PR (ed), Chemical Engineering Progress 2008; 104 (11):31-41.

Spiers H, Pankhurst Q, Parkin I, Caruana D, Kratzer MC. Thermal imaging studies of the SHS Preparation of MgFe2O4. International Journal on Self-Propagating High-Temperature Synthesis 2004; 13: 205.

Conference Presentations

Sellers MCK, Richards, AE. The Rainham Chemical Works Explosion: A 100th Anniversary Perspective. Materials Science & Technology 2016, Salt Lake City, UT, October 23-27, 2016.

Lux S, Marsh CP, Feickert, CA, Sellers MCK, Friedl AP, Pagan-Vazquez A, Foster CJ, Hesterberg JR, Magerko JA. Generative textiles for non-rotary power production from wind. ASME 2012 6th International Conference on Energy Sustainability, San Diego, CA, July 23-26, 2012.

Sellers MCK, Zussblatt N, Friedl A, Lux S, Hesterberg J, Feickert C, Morefield S, Marsh CP. Design of flexible supercapacitors using metal oxide-decorated carbon nanotube sheet. MRS Fall Meeting, Boston, MA, November 28-December 2, 2011.

Sellers MCK, Seebauer EG. Nanostructured Mn-doped TiO2 synthesized by atomic layer deposition for spintronics applications. AIChE Annual Meeting, Salt Lake City, UT, November 7-12, 2010.

Sellers MCK, Nasim F, Bhatti AS, Seebauer EG. Transient behavior of defects at TiO2 interfaces. AIChE Annual Meeting, Salt Lake City, UT, November 7-12, 2010.

Sellers MCK, Seebauer EG. Structural and magnetic properties of anatase Mn-doped TiO2 film synthesized by atomic layer deposition. AVS 57th International Symposium, Albuquerque, NM, October 17-22, 2010.

Sellers MCK, Nasim F, Bhatti AS, Seebauer EG. Improvement of metal oxide catalyst reactivity by modification of surface Fermi level. AIChE Annual Meeting, Nashville, TN, November 8-13, 2009.

Kratzer MC, Seebauer EG. Characterization of metal oxide electrical properties for band engineered

catalysis. AIChE Annual Meeting, Philadelphia, PA, November 16-21, 2008.

Spiers H, Kratzer MC. Thermal imaging studies of the SHS Preparation of MgFe2O4. International Symposium on Self-Propagating High-Temperature Synthesis, Krakow, Poland, July 2003.

Posters

Nasim F, Sellers MCK, Bhatti AS, Seebauer EG. Charge buildup and optical studies of electric fields at oxide-silicon interfaces. RAK-CAM International Workshop on Advanced Materials, Ras Al Khaimah, United Arab Emirates, February 21-23, 2010.

Sellers MCK, Nasim F, Bhatti AS, Seebauer EG. Improvement of metal oxide catalyst reactivity by modification of surface Fermi level. AVS 56th International Symposium, San Jose, CA, November 8-13, 2009.

Kratzer, MC, Seebauer EG. Characterization of metal oxide electrical properties for band engineered catalysis. AVS 55th International Symposium, Boston, MA, October 24-29, 2008.

Kratzer, MC, Seebauer EG. Growth and characterization of TiO2 for band engineered catalysis. AAAS Annual Meeting, Boston, MA, February 14-17, 2008.

*Also as Kratzer MC and Sellers MCK

Project Experience

Oil & Gas

Dr. Sellers has experience with upstream, midstream, and downstream oil and gas operations, assisting in multidisciplinary failure investigations as well as advising industrial clients. Selected examples of this work include:

- Damage mechanism assessment: Surveyed and evaluated refinery, offshore platform, and LNG facility systems and components potentially susceptible to damage mechanisms (e.g., sulfidation corrosion, stress corrosion cracking, atmospheric corrosion, corrosion under insulation) as a function of service and/or environmental conditions.
- Inspection regime review: Reviewed facility, unit, and component-level inspection programs and regimes for refineries and offshore platforms, including the results of non-destructive testing (e.g., radiographic testing, ultrasonic testing) and repair and mitigation documentation.
- Failure analysis: Investigated refinery, offshore platform, and undersea pipeline loss of containment events and system performance impacts attributed to factors such as general and localized corrosion, equipment and component fabrication, material selection, temperature, pressure, and process fluid composition upsets, chemical treatment strategies, cleaning/pigging activities, catalyst quality, and rotating and static equipment maintenance.
- Risk-based inspection: Evaluated risk-based inspection programs for piping and pressure vessels at refineries and offshore platforms, focusing on operator assessments of likelihood and consequence of failure, as well as the determination of inspection frequencies and methodologies.
- Pre-commissioning, commissioning, and startup evaluation: Assessed hydrotest-related activities (e.g., flushing, draining, drying) and utility demands.

Dr. Sellers has also worked extensively on natural gas integrity management programs and projects. A few examples include:

- Direct assessment: Conducted third-party reviews of a natural gas utility's external corrosion direct assessment (ECDA), internal corrosion direct assessment (ICDA), and stress corrosion cracking direct assessment (SCCDA) procedures and practices. Revised program procedures, verified inspection findings, project deliverables, and developed QA/QC frameworks.
- Indirect inspection tool (IIT) data analysis: Reviewed and synthesized the results of surface-level techniques for natural gas pipeline assessments such as close interval surveys (CIS), direct current voltage gradient (DCVG)/alternating current voltage gradient (ACVG) surveys, and soil resistivity testing.
- Cathodic protection (CP): Reviewed historical CP records, CP schemes for new, underground assets, and proposals to upgrade pre-existing CP systems.
- Corrosion control: Performed gap analyses for natural gas utility involving comparison of operator standards, procedures, and guidance documents to PHMSA, API, ASME, NACE, and ASTM requirements and recommendations.
- Pipeline casings: Evaluated operator in-line inspection (ILI) data and ECDA findings to investigate likelihood of external corrosion occurring at particular locations on cased pipe segments.
- Root-cause analysis: Synthesized information about pipeline construction, inspection, and maintenance to understand root causes of leaks, ruptures, and coating deterioration.
- Data asset management: Developed asset registry and data improvement roadmap for critical gas operations datasets.

Industrial Process Facilities

Dr. Sellers has conducted investigations into a broad range of industrial process facilities, assisting clients in understanding system performance under real-world conditions. Examples include:

- Sulfuric acid plant: Evaluated impacts of process factors on boiler leak.
- Refrigeration facilities: Assessed root causes of failures in condensers and heat exchangers.
- Ethylene oxide sterilization facility: Investigated design, testing, and monitoring of sterilizer chamber and aeration emission control equipment (e.g., scrubbers, catalytic oxidation units).
- Thermal power station: Assessed operating impacts on integrity of power plant condensers and feedwater heaters.
- Molybdenum extraction facility: Determined root cause of dry, liquid chlorine release at offloading station.
- Pharmaceutical plants: Executed corrosion testing of candidate materials for plant process piping.
- Trichloroisocyanuric acid (TCCA) warehouse: Evaluated decomposition of TCCA in the context of product packaging integrity and environmental sampling results.
- Gasoline storage tanks: Analyzed fiberglass reinforced plastic shell of steel tank intended for underground storage of flammable and combustible liquids.

Consumer Products and Medical Devices

Dr. Sellers has conducted analyses of consumer products and medical devices for product manufacturers and law firms retained in related disputes. Examples of these investigations include:

- Drug delivery and percutaneous treatment devices: Analyzed compositional and mechanical properties of metallic, polymeric, and ceramic devices.

- Roofing materials: Characterized metallic roof panels to assess deterioration and damage (e.g., coating defects, corrosion).
- Coated metallic parts: Chemical analysis and simulated use testing of coated consumer electronics and kitchen appliance accessories.
- Food and drink packaging: Performed failure analysis on olive oil bottles, wine bottles, whipped cream cans, among others.

Semiconductor Manufacturing and Thin-Film Characterization

Dr. Sellers leverages her foundational microelectronics processing knowledge, including as the coauthor of a textbook entitled “Charged semiconductor defects: Structure, thermodynamics, and diffusion,” to assist clients in the integrated circuit fabrication and insurance sectors. Specific examples include:

- Equipment performance: Evaluated issues such as a pinhole leak in a radio frequency (RF) coil in a laser diode fabrication tool, wafer contamination resulting in slippage during CVD tool handling, and ion implantation underdosing resulting in goodness of fit failures.
- Impact assessments: Assessed impacts of power outages and cooling water system shutdowns on cleanroom operations, equipment performance, and product quality.
- Equipment storage and preservation: Analyzed effects of moisture and debris exposure on tool integrity and operability.