Exponent®
Engineering & Scientific Consulting

Andrew Worthen, Ph.D., P.E.

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Professional Profile

Dr. Andrew Worthen specializes in the use of scientific and engineering principles to understand the performance of products and the processes by which they are made. He leads investigations that include failure analysis and root cause determination, risk assessment, research and development, and intellectual property evaluation.

Dr. Worthen helps clients solve complex problems related to material systems by utilizing fundamentals of chemical engineering, materials characterization, colloid and surface science, and polymer physics. For example, he often leads complex failure investigations involving scientific evaluation of material properties, product formulations, installation practices, end use conditions, and degradation mechanisms. Many of his investigations are related to alleged construction defects or product defects. He also regularly assists clients with new product development and qualification testing programs. He has evaluated building materials, plumbing components, plastic pipe and tubing (e.g., HDPE, PEX, polypropylene, and CPVC), rubber hoses and fittings, paints and coatings, adhesives, textiles, medical devices, consumer electronics, communications systems, foods, cosmetics, and personal care products.

Dr. Worthen also regularly assists clients to meet their product stewardship objectives in complex regulatory settings. He has led scientific assessments at product lifecycle stages ranging from product development to maturity, and he often assists clients who aim to launch new products or who have new concerns regarding existing products due to new regulations or market conditions.

Dr. Worthen's academic background and areas of focus include dispersions and colloidal systems. In these areas, he consults on topics such as formulation design, component compatibility, and product stability. Prior to joining Exponent, Dr. Worthen conducted his doctoral research in chemical engineering focused on formulating complex fluid mixtures containing polymers, surfactants, and nanomaterials. During his research, he developed customized methods to examine the impact of molecular-scale interactions on the bulk properties of dispersions, emulsions, and foams. These formulations were developed for use in the energy and environmental industries for applications such as enhanced oil recovery, hydraulic fracturing, and oil spill cleanup.

Academic Credentials & Professional Honors

Ph.D., Chemical Engineering, University of Texas, Austin, 2015

B.S., Chemical Engineering, University of Toledo, 2010

Licenses and Certifications

Professional Engineer Chemical, Florida, #104678

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Professional Engineer Chemical, Hawaii, #PE-21406-0

Professional Engineer Chemical, Texas, #133642

Professional Engineer Chemical, Washington, #22030226

Prior Experience

Undergraduate Research Assistant, University of Toledo, 2009-2010

Technical Services Department Co-op, Marathon Petroleum Company, Spring 2010

Environmental Department Co-op, Marathon Petroleum Company, Spring 2008, Fall 2008, Summer 2009

Professional Affiliations

American Institute of Chemical Engineers (AIChE)

American Chemical Society (ACS)

Society of Plastics Engineers (SPE)

Product Stewardship Society

American Society for Testing and Materials (ASTM)

Publications

Thelen J, Onorato J, Liebman A, Lenz O, and Worthen AJ. Microstructural Analysis of Polyolefins Using Raman Microscopy. Proceedings of the SPE Annual Technical Conference & Exhibition, ANTEC 2026.

Worthen AJ and Beckham H. Measurement of Water Management in Textiles. Chapter 5 in Analytical Methods for a Textile Laboratory, 4th Edition. American Association of Textile Colorists and Chemists (AATCC). 2023. ISBN 978-1-942323-22-8.

Worthen AJ, Murphy EB. Transition Metal-Catalyzed Degradation of Polymers: Review and Future Perspectives. Proceedings of the SPE Annual Technical Conference & Exhibition, ANTEC 2020.

Worthen AJ, Irving KS, Lapitsky Y. Supramolecular Strategy Effects on Chitosan Bead Stability in Acidic Media: A Comparative Study. Gels 2019. 5(1):11.

Worthen AJ, Schwartz JM, Lee DE, Robrock KR, Kalmes RM. Flame Retardants in Consumer Products: Overview and Perspective on the Proposed CPSC Ban. Proceedings of the SPE Annual Technical Conference & Exhibition, ANTEC 2018.

Mohammad L, Kim I, Beygi MR, Worthen AJ, Huh C, Johnston KP, Wheeler MF, DiCarlo DA. Foam Generation Hysteresis in Porous Media: Experiments and New Insights. Transport in Porous Media 2017. 116(2):687-703.

Qajar A, Xue Z, Worthen AJ, Johnston KP, Huh C, Bryant SL, Prodonavic M. Modeling fracture propagation and cleanup for dry nanoparticle-stabilized-foam fracturing fluids. Journal of Petroleum Science and Engineering 2016. 146:210-221.

Chen Y, Elhag AS, Worthen AJ, Reddy PP, Ou AM, Hirasaki GJ, Nguyen QP, Biswal SL, Johnston KP.

High Temperature CO2-in-Water Foams Stabilized with Cationic Quaternary Ammonium Surfactants. Journal of Chemical & Engineering Data 2016. 61(8): 2761-2770.

Chen Y, Elhag AS, Reddy PP, Chen H, Cui L, Worthen AJ, Kun M, Quintanilla H, Noguera JA, Hirasaki GJ, Nguyen QP, Biswal SL, Johnston KP. Phase behavior and interfacial properties of a switchable ethoxylated amine surfactant at high temperature and effects on CO2-in-water foams. Journal of Colloid and Interface Science 2016. 470:80-91.

Kim I, Worthen AJ, Johnston KP, DiCarlo DA, Huh C. Size-dependent properties of silica nanoparticles for Pickering stabilization of emulsions and foams. Journal of Nanoparticle Research 2016; 18(4):82.

Worthen AJ, Tran V, Cornell KA, Truskett TM, Johnston KP. Steric stabilization of nanoparticles with grafted low molecular weight ligands in highly concentrated brines including divalent ions. Soft Matter 2016; 12(7):2025-2039.

Xue Z, Worthen AJ, Qajar A, Robert I, Bryant SL, Huh C, Prodanović M, Johnston KP. Viscosity and stability of ultra-high internal phase CO2-in-water foams stabilized with surfactants and nanoparticles with or without polyelectrolytes. Journal of Colloid and Interface Science 2016; 461:383-395.

Xue Z, Worthen AJ, Da C, Qajar A, Ketchum IR, Alzobaidi S, Huh C, Prodanović M, Johnston KP. Ultra-dry carbon dioxide-in-water foams with viscoelastic aqueous phases. Langmuir 2016; 32(1):28-37.

Chen Y, Elhag AS, Cui L, Worthen AJ, Reddy PP, Noguera JA, Ou AM, Ma K, Puerto M, Hirasaki GJ, Nguyen QP, Biswal SL, Johnston KP. CO2-in-water foam at elevated temperature and salinity stabilized with a nonionic surfactant with a high degree of ethoxylation. Industrial & Engineering Chemistry Research 2015; 54(16):4252-4263.

Prigiobbe V, Worthen AJ, Johnston KP, Huh C, Bryant SL. Transport of nanoparticle-stabilized CO2-foam in porous media. Transport in Porous Media 2015; 111(1):265-285.

Foster LM*, Worthen AJ*, Foster EL, Dong J, Roach CM, Metaxas AE, Hardy CD, Larsen ES, Bollinger JA, Truskett TM, Bielawski CW, Johnston KP. High interfacial activity of polymers "grafted through" functionalized iron oxide nanoparticle clusters. Langmuir 2014; 30(34):10188-10196. (Note: * denotes equal author contribution).

Dong J, Worthen AJ, Foster LM, Chen Y, Cornell KA, Bryant SL, Truskett TM, Bielawski CW, Johnston KP. Modified montmorillonite clay microparticles for stable oil-in-seawater emulsions. ACS Applied Materials & Interfaces 2014; 6(14):11502-11513.

Yu H, Yoon KY, Neilson BM, Bagaria HG, Worthen AJ, Lee JH, Cheng V, Bielawski CW, Johnston KP, Bryant SL, Huh C. Transport and retention of aqueous dispersions of superparamagnetic nanoparticles in sandstone. Journal of Petroleum Science and Engineering 2014; 116:115-123.

Chen Y, Elhag AS, Poon BM, Cui L, Ma K, Liao SY, Reddy PP, Worthen AJ, Hirasaki GJ, Nguyen QP, Biswal SL, Johnston KP. Switchable nonionic to cationic ethoxylated amine surfactants for CO2 Enhanced Oil Recovery in high-temperature, high-salinity carbonate reservoirs. SPE Journal 2014; 19(02):249-259.

Worthen AJ, Foster LM, Dong J, Bollinger JA, Peterman AH, Pastora LE, Bryant SL, Truskett TM, Bielawski CW, Johnston KP. Synergistic formation and stabilization of oil-in-water emulsions by a weakly interacting mixture of zwitterionic surfactant and silica nanoparticles. Langmuir 2014; 30(4):984-994.

Worthen AJ, Bryant SL, Huh C, Johnston KP. Carbon dioxide□in□water foams stabilized with nanoparticles and surfactant acting in synergy. AIChE Journal 2013; 59(9):3490-3501.

Bagaria HG, Neilson BM, Worthen AJ, Xue Z, Yoon KY, Cheng V, Lee JH, Velagala S, Huh C, Bryant SL,

Bielawski CW, Johnston KP. Adsorption of iron oxide nanoclusters stabilized with sulfonated copolymers on silica in concentrated NaCl and CaCl2 brine. Journal of Colloid and Interface Science 2013; 398:217-226.

Bagaria HG, Yoon KY, Neilson BM, Cheng V, Lee JH, Worthen AJ, Xue Z, Huh C, Bryant SL, Bielawski CW, Johnston KP. Stabilization of iron oxide nanoparticles in high sodium and calcium brine at high temperatures with adsorbed sulfonated copolymers. Langmuir 2013; 29(10):3195-3206.

Worthen AJ, Bagaria HG, Chen Y, Bryant SL, Huh C, Johnston KP. Nanoparticle-stabilized carbon dioxide-in-water foams with fine texture. Journal of Colloid and Interface Science 2013; 391:142-151.

Bagaria HG, Xue Z, Neilson BM, Worthen AJ, Yoon KY, Nayak S, Cheng V, Lee JH, Bielawski CW, Johnston KP. Iron oxide nanoparticles grafted with sulfonated copolymers are stable in concentrated brine at elevated temperatures and weakly adsorb on silica. ACS Applied Materials & Interfaces 2013; 5(8):3329-3339.

Worthen AJ, Lapitsky Y. Stabilization of bioderived surfactant/polyelectrolyte complexes through surfactant conjugation to the biopolymer. Colloid and Polymer Science 2011; 289(14):1589-1596.

Selected Presentations

Diederichsen K, Buss H, Liffland S, and Worthen AJ. Managing Risks of Sustainability and Circularity Claims. Product Stewardship Society Annual Conference (PSX), Houston, TX, September 16-18, 2025.

Worthen AJ, Razzaque S, Mantione L. Surprises, Gaps, and Near Misses for the Product Steward. Product Stewardship Society Annual Conference (PSX), Boston, MA, October 17-19, 2023.

Worthen AJ, Rackl SM, Grzebyk K, Hearon S. Fluorinated Chemistry and Consumer Product Compliance Challenges. Product Stewardship Society Annual Conference (PSX), Louisville, KY, October 18-20, 2022.

Worthen AJ, Rackl SM, Grzebyk K. Fluorinated Chemicals and Challenges to Product Stewardship. Product Stewardship Society Annual Conference (PSX), Anaheim, CA, September 28-30, 2021.

Worthen AJ, Murphy EB. Transition Metal-Catalyzed Degradation of Polymers: Review and Future Perspectives. SPE Annual Technical Conference & Exhibition, ANTEC 2020, Virtual, March 30-May 5, 2020.

Worthen AJ, Schwartz JM, Lee DE, Robrock KR, Kalmes RM. Flame Retardants in Consumer Products: Overview and Perspective on the Proposed CPSC Ban. SPE Annual Technical Conference & Exhibition, ANTEC 2018, Orlando, FL, May 7-10, 2018.

Worthen AJ, Taghavy A, Aroonsri A, Kim I, Johnston KP, Huh C, Bryant SL, DiCarlo DA. SPE 175065, Multi-scale evaluation of nanoparticle-stabilized CO_2-in-water foams: From the benchtop to the field. SPE Annual Tech. Conf. and Expo., Houston, TX, September 28-30, 2015.

Worthen AJ, Xue Z, Parikh PS, Dickey TR, Cornell KA, Quintanilla H, Huh C, Bryant SL, Johnston KP. Salt-tolerant and interfacially active nanoparticles which generate viscous and stable CO_2-in-brine foams. 5th International Colloids Conf., Amsterdam, Netherlands, June 21-24, 2015.

Worthen AJ, Foster LM, Dong J, Yu G, Bollinger JA, Truskett TM, Bryant SL, Bielawski CW, Johnston KP. Emulsions of oil in seawater stabilized with particles and surfactants. American Institute of Chemical Engineers Annual Meeting, Atlanta, GA, November 16-21, 2014.

Worthen AJ, Parikh PS, Chen Y, Bryant SL, Huh C, Johnston KP. Carbon dioxide-in-water foams stabilized with a mixture of nanoparticles and surfactant for CO_2 storage and utilization applications. GHGT-12, Austin, TX, October 5-9, 2014.

Worthen AJ, Johnston KP, Hirasaki GJ, Nguyen QP, Bryant SL, Huh C, Chen Y, Elhag AS. Design of surfactants and nanoparticles for CO_2 sequestration, Enhanced Oil Recovery, and electromagnetic imaging. 247th American Chemical Society National Meeting & Expo, Dallas, TX, March 16-20, 2014.

Worthen AJ, Bagaria HG, Chen Y, Bryant SL, Huh C, Johston KP. Carbon dioxide-in-water foams stabilized with nanoparticle and surfactant amphiphiles. 245th American Chemical Society National Meeting & Expo, New Orleans, LA, April 7-11, 2013.

Worthen AJ, Bagaria HG, Chen Y, Bryant SL, Huh C, Johnston KP. SPE 154285, Nanoparticle stabilized carbon dioxide in water foams for Enhanced Oil Recovery. SPE Improved Oil Recovery Symposium, Tulsa, OK, April 14-18, 2012.