

Exponent®
Engineering & Scientific Consulting

Claudio V B Favero, Ph.D., P.E.

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Professional Profile

Dr. Fávero is a chemical engineer at Exponent who applies first-principles analysis grounded in transport phenomena, reaction engineering, and physical chemistry to investigate failures, assess process and equipment performance, and evaluate fire and explosion hazards. His work spans design, operation, failure analysis, and dispute resolution, from proactive safety and process evaluations to post-incident investigations. Dr. Fávero delivers rigorous, defensible analyses that inform decision makers, support risk-mitigation strategies, and facilitate regulatory compliance.

Dr. Fávero works across industries such as energy and oil & gas, chemical and pharmaceutical, and consumer products. Grounded in the scientific method and repeatable testing, his investigations integrate field inspections, plant audits, laboratory testing, and analytical and computational modeling to identify root causes and assess alternative causal hypotheses. Industry clients typically engage Dr. Fávero for product and process development, failure analysis, and risk mitigation. In the legal sector, he is frequently retained as a testifying expert in product liability, industrial accidents, and engineering, procurement, and construction (EPC) and intellectual property (IP) disputes.

Prior to joining Exponent, Dr. Fávero earned his Ph.D. in Chemical Engineering from the University of Michigan under the supervision of Prof. H. Scott Fogler. His doctoral research focused on the physical chemistry of crude oil, with an emphasis on wax and asphaltene deposition, resulting in significant advances in understanding the colloidal nature of asphaltenes as well as wax and asphaltene fouling mechanisms. He developed a laboratory apparatus to evaluate the performance of asphaltene deposition inhibitors and contributed to the development of software to predict wax deposit formation and growth in oil pipelines. As part of his doctoral research, Dr. Fávero collaborated with TotalEnergies in Pau, France, to implement and validate his asphaltene inhibitor evaluation methodology for field applications. Prior to his doctoral studies, he worked at Petrobras in São Mateus do Sul, Brazil, where he supported performance testing of hydrotreatment reactors.

Academic Credentials & Professional Honors

Ph.D., Chemical Engineering, University of Michigan, Ann Arbor, 2018

M.S., Chemical Engineering, University of Michigan, Ann Arbor, 2017

B.S., Chemical Engineering, Maringa State University, Brazil, 2011

Licenses and Certifications

Professional Engineer Chemical, California, #7279

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Prior Experience

Research Assistant, University of Michigan, 2013-2018

Researcher, Total E&P in Lacq, France, 2016

Intern, Petrobras in Sao Mateus do Sul, Brazil, 2011

Undergraduate Research Assistant, University of Michigan, 2010

Professional Affiliations

AIChE – American Institute of Chemical Engineers (Member; Member, Institute Award Committee)

SPE – Society of Petroleum Engineers (Member; Former Membership Chairperson, New York and New England Petroleum Section, 2019)

ACS – American Chemical Society (Member)

Exponent Diversity, Equity, and Inclusion Advisory Committee (Member, Inaugural Cohort)

Flagship Pioneering Institutional Biosafety Committee (Community Representative, 2022–2024)

UL 30 – Metallic and Nonmetallic Safety Cans for Flammable and Combustible Liquids (Technical Member, 2025–Present)

Languages

Portuguese

Publications

Duran, J.A., Schoeggl, F.F., Yarranton, H.W., Fávero, C.V.B., Fogler, H.S. "Effect of air on the kinetics of asphaltene precipitation from diluted crude oils," Energy & Fuels, 2019, 34(2), 1408-1421. DOI: 10.1021/acs.energyfuels.9b03280

Mahir, L.H.A., Fávero, C.V.B., Ketjuntiwa, T., Fogler, H.S., Larson, R.G. "Mechanism of wax deposition on cold surfaces: gelation and deposit aging," Energy & Fuels, 2018, 33(5), 3776-3786. DOI: 10.1021/acs.energyfuels.8b03139

Fávero, C.V.B., Moran, S., Eniola-Adefeso, O. "The power of peer mentoring in enabling a diverse and inclusive environment in a chemical engineering graduate program," Chemical Engineering Education, 2018, 52(2), 79-88.

Fávero, C.V.B., Maqbool, T., Hoepfner, M., Haji-Akbari, N., Fogler, H.S. "Revisiting the flocculation kinetics of destabilized asphaltenes," Advances in Colloid and Interface Science, 2017, 244, 267-280. DOI: 10.1016/j.cis.2016.06.013

Fávero, C.V.B., Hanpan, A., Phichphimok, P., Binabdullah, K., Fogler, H.S. "Mechanistic investigation of asphaltene deposition," Energy & Fuels, 2016, 30(11), 8915-8921.

Hoepfner, M.P., Fávero, C.V.B., Haji-Akbari, N., Fogler, H.S. "The fractal aggregation of asphaltenes," Langmuir, 2013, 29(28), 8799-8808. DOI: 10.1021/la401406k

Lenzi, G.G., Fávero, C.V.B., Colpini, L.M.S., Bernabe, H., Baesso, M.L., Specchia, S., Santos, O.A.A.

"Photocatalytic reduction of Hg (II) on TiO2 and Ag/TiO2 prepared by the sol-gel and impregnation methods," Desalination, 2011, 270(1-3), 241-247.

Lenzi, G.G., Lenzi, E.K., Fávero, C.V.B., Lenzi, M.K., Jorge, R.M.M., dos Santos, O.A.A., Jorge, L.M.M. "Simulation studies of steam reforming of methane using Ni-Al2O3 catalysts," International Journal of Chemical Reactor Engineering, 2010, 8(1). DOI: 10.2202/1542-6580.2110

Conference Publications and Presentations

Fávero, C.V.B., Li, C., Kersey, K., Myers, T.J., A historical review of standards and regulations governing portable fuel containers, safety cans, and disposable containers. AIChE Spring Meeting and 22nd Global Congress on Process Safety, Houston, TX, 2026.

Fávero, C.V.B., Li, C., Kersey, K. Flammable liquid containers through the eyes of a chemical engineer. AIChE Boston Chapter Meeting, 2026.

Stern, M., Fávero, C.V.B., Ibarreta, A., Colella, F., Morrison, F., Myers, T.J., Flame arrestor failures in industrial equipment and consumer products. AIChE Spring Meeting and 17th Global Congress on Process Safety, Virtual, 2021.

Fávero, C.V.B., Parker, S., Stern, M.C., Kytomaa, H.K. Impact of time on asphaltene destabilization detection in unconventional fuels. AIChE Spring Meeting and 15th Global Congress on Process Safety, 2019.

Fávero, C.V.B., Kach, J., Fogler, H.S. The effect of polydispersity and amphiphiles on asphaltene stability. 19th International Conference on Petroleum Phase Behavior and Fouling, USA, 2018.

Mahir, L.H.A., Fávero, C.V.B., Ketjuntiwa, T., Fogler, H.S., Larson, R.G. Mechanisms of wax deposition on cold surfaces. 19th International Conference on Petroleum Phase Behavior and Fouling, USA, 2018.

Larson, R.G., Fávero, C.V.B. Transport problems in the spirit of Stuart Churchill for teaching and research at the University of Michigan. AIChE Annual Meeting, 2017.

Eniola Adefero, E., Fávero, C.V.B., Moran, S.E. Peer mentoring in graduate school - fostering diversity to achieve scholarly excellence. AIChE Annual Meeting, 2017.

Fávero, C.V.B., Hanpan, A., Phichphimok, P., Binabdullah, K., Fogler, H.S. Mechanistic investigation of asphaltene deposition. 17th International Conference on Petroleum and Phase Behavior and Fouling, Denmark, 2016.

Fávero, C.V.B., Fogler, H.S. Experimental study on the formation of barium sulfate deposits in interior wall of pipes. 14th International Conference on Petroleum and Phase Behavior and Fouling, France, 2013.

Fávero, C.V.B., Fogler, H.S. Mechanism of asphaltene precipitation via small-angle neutron scattering. AIChE Annual Meeting, 2012.

Fávero, C. V. B., Lenzi, G. G., Colpini, L., Baesso, M. L., Polv, N. P., Santos, O. A. A. Photocatalytic reduction of Hg(II) on catalyst prepared by the sol-gel and impregnation methods. International Conference on the Physics of Non-Crystalline Solids, Foz do Iguaçu, 2009; p. 84.

Souza, M. C. P., Fávero, C. V. B., Lenzi, G. G., Jorge, L. M. M., Santos, O. A. A., Photocatalytic discoloration of reactive blue 5G dye in the presence of mixed oxides and with iron and silver addition. International Conference on the Physics of Non-Crystalline Solids, Foz do Iguaçu, 2009; p. 84

Lenzi, G. G., Fávero, C. V. B., Lenzi, E. K., Santos, O. A. A., Jorge, L. M. M. Methane steam reforming using Ni/Al2O3 sol-gel and industrial catalyst. International Conference on the Physics of Non-Crystalline

Solids, Foz do Iguaçu, 2009; p. 85.

Fávero, C. V. B., Cantao, M. P., Jorge, L. M. M., Jorge, R. M. M., Caracterização e análise de catalisadores industriais de reforma a vapor do metanol e shift. VIII Congresso Brasileiro de Engenharia Química em Iniciação Científica, Uberlandia, 2009; pp. 238-239.

Fávero, C. V. B., Souza, M. C. P., Santos, O. A. A., Jorge, L. M. M., Descoloração do Corante Reativo Azul 5G na presença de catalisadores TiO2, CeO2-TiO2-gammaAl2O3 e Fe- CeO2-TiO2-gammaAl2O3. VIII Congresso Brasileiro de Engenharia Química em Iniciação Científica, Uberlandia, 2009; pp. 239-240.

Fávero, C. V. B., Lenzi, G. G., Polv, N. P., Santos, O. A. A., Avaliação da TiO2 comercial de Sol-Gel na fotorredução de soluções de mercúrio. VIII Congresso Brasileiro de Engenharia Química em Iniciação Científica, Uberlandia, 2009; pp. 240-240.

Fávero, C. V. B., Lenzi, G. G., Colpini, L.M.S., Santos, O. A. A. Diferenças texturais e estruturais da TiO2 comercial e Sol-Gel dopados com ferro e prata. VIII Congresso Brasileiro de Engenharia Química em Iniciação Científica, Uberlandia, 2009; pp. 354-355.

Fávero, C. V. B., Santos, O. A. A. Hidrogenação do oleato de metila utilizando catalisadores de Ru/TiO2 E Ru-Sn/TiO2. XVII Encontro Anual de Iniciação Científica, Foz do Iguaçu, 2008.

Corradini, S. A. S., Fávero, C. V. B., Soares, C. M., Santos, O. A. A. Álcoois graxos obtidos a partir da hidrogenação seletiva do oleato de metila. XVII Congresso Brasileiro de Engenharia Química, Recife, 2008.

Invited Presentations

Favero, C.V.B., Carreiras em Engenharia Quimica. Seminario de Engenharia Quimica na Universidade Federal do Mato Grosso do Sul, 2024.

Morrison DR, Fávero C.V.B. Pre-conference Workshop. Fundamentals of accidental fires and explosions. 9th CCPS Latin American Conference on Process Safety, Rio de Janeiro, Brazil, 2022.

Favero, C.V.B., Pursuing a career as consultant after grad school. Chemical Engineering Seminar at Worcester Polyethnic Institute (WPI), 2022.

Project Experience

Energy and Oil & Gas Industry

Dr. Fávero's experience in the energy and oil & gas industry encompasses upstream, midstream, and downstream operations and renewables. His experience includes pipeline flow assurance, process plant design and performance evaluation, industrial accident investigation, and fire and electrostatic hazard assessment.

- **Process Plant Design and Performance Disputes.** Supported clients in evaluating process plant design and performance, often within the context of engineering, procurement, and construction (EPC) contract disputes. Experience includes working with distillation columns and hydrotreaters in petroleum refineries, long-term monomer storage and inhibitor depletion for styrene, ground flare field performance in a polymer plant, gas-liquid separators and knockout drum (KOD), produced-water treatment and injection facilities for enhanced oil recovery (EOR) and a helium compression plant for cryogenic cooling in a power generation facility.

- **Industrial Accident Investigations.** Conducted analyses of incidents at chemical plants and refineries to reconstruct process conditions, evaluate operator actions and safety systems, and identify the physical and chemical mechanisms contributing to accidents or failures. Experience includes assessments of chemical releases, overpressure incidents, and runaway reaction scenarios.
- **Oil Transportation in Pipelines.** Performed investigations involving the flow of petroleum and petroleum distillates in pipelines to evaluate operational limitations, restart and shutdown performance, fouling, and safety incidents. Experience includes analysis of pipeline design and operation, batch-operated systems, and physical-chemical characterization of oils such as pour point, wax appearance temperature (WAT), and non-Newtonian rheology. Experience also includes performance testing of flow assurance additives such as drag-reducing agents (DRA) and pour-point depressants.
- **Fouling of Pipelines and Production Equipment.** Led root-cause failure analyses of fouling in pipeline and production equipment systems, including wax gelation and deposition on cold surfaces, asphaltene deposition and sedimentation in storage tanks, and thermal fouling and coking in heat exchangers. Work included evaluating chemical mitigation strategies and inhibitor performance for fouling prevention.
- **Processing, Storage, and Use of Residential Heating Oil.** Investigated residential heating oil systems. Experience includes analysis of fuel composition in biodiesel blends, including fuels classified under ASTM D396 (Standard Specification for Fuel Oils) and ASTM D6751 (Standard Specification for Biodiesel Fuel Blend Stock B100 for Middle Distillate Fuels), fuel degradation and sludge formation, material compatibility between heating oil and equipment components such as gaskets and O-rings, and performance evaluation of heating equipment.
- **Electrostatic Discharges and Fire Hazards.** Evaluated electrostatic ignition hazards in fuel and flammable liquid systems and assessed mitigation measures often based on guidance from NFPA 77 (Recommended Practice on Static Electricity) and IEC 60079-32-1 (Explosive Atmospheres – Electrostatic Hazards). Experience includes investigations of electrostatic charging and discharge involving liquid fuel transfer systems and particulates suspended in natural gas transported in high-density polyethylene (HDPE) pipelines.

Chemical and Pharmaceutical

Dr. Fávero's chemical and pharmaceutical experience encompasses process safety investigations, emissions analysis, product liability matters, and process development and optimization across a range of chemical and pharmaceutical applications.

- **Substance Emissions from Substrates.** Evaluated emissions of chemical constituents spanning a broad volatility range, including volatile organic compounds (VOCs), semi-volatile organic compounds, and polychlorinated biphenyls (PCBs), originating from construction materials and other substrates to identify contamination sources and assess impacts on indoor air quality (IAQ). Work included laboratory emission testing and emission modeling consistent with ASTM D5116 (Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials) and the ISO 16000-9, 10, and 11 series (Determination of Volatile Organic Compound Emissions from Building Products and Furnishings) to quantify release rates and evaluate the transport and fate of substances under building-specific conditions.
- **Hair and Cosmetic Products and Burn Injuries.** Analyzed the role of hair and cosmetic products, including aerosol sprays and flammable liquids, in burn injuries. Experience includes flammability

testing, flash point analysis, ignition source analysis, product composition changes upon application, and burn injury mechanism analysis.

- **Scale-Up and Process Optimization.** Assisted clients with chemical process scale-up and optimization, addressing areas such as mixing and suspension stability, gel formation with targeted mechanical properties, and mitigation of air bubble entrainment in pharmaceutical injectable products.
- **Hydrogen Generation and Reactor Explosion.** Investigated an explosion incident involving a hydrogen generator. Experience includes analysis of reactive chemical hazards and hydrogen hazards, overpressure and deflagration analysis, and process safety evaluation of the conditions leading to the explosion.
- **Asbestos in Refractory Materials.** Evaluated the historical composition of refractory materials and thermal insulation materials used in the steelmaking industry to assess the presence or absence of asbestos-like material. Experience includes historical review of refractory material formulations and analysis of thermal decomposition of asbestos-like minerals using analytical techniques including X-ray diffraction (XRD).

Consumer Products

Dr. Fávero has conducted accident reconstruction and failure analysis for consumer product cases, assessing failure mechanisms, product performance, and adherence to relevant safety standards within product liability litigation.

- **Portable Fuel Containers and Safety Cans.** Analyzed the role of flammable liquids, fuels, and fuel containers such as gas cans and ethanol bottles in burn injuries. Experience includes evaluation of ignition scenarios, flame propagation, and the role of fuel containers in burn injury incidents, as well as performance testing relative to applicable standards including UL 30 (Metal Safety Cans for Flammable Liquids), ASTM F3326 (Flame Mitigation Devices on Portable Fuel Containers), and ASTM F3429 (Performance of Flame Mitigation Devices Installed in Disposable and Pre-Filled Flammable Liquid Containers), as applicable to the subject product and period of manufacture.
- **Pressurized Canisters and Pressure Cookers.** Analyzed overpressure incidents involving pressurized consumer products such as pressure cookers and compressed gas canisters. Experience includes pressure relief valve and burst disc performance, vessel and closure failure modes, and product compliance relative to ASTM F2653 (Paintball Valve Threaded Connection), UL 136 (Pressure Cookers), and UL 1026 (Electric Household Cooking Appliances).
- **Blenders.** Evaluated the performance and failure mechanisms of countertop, personal, and high-performance blenders. Experience conducting accident reconstruction of mechanical and thermal failures and investigating the role of blenders in burn and laceration injuries.
- **Carbon Monoxide Incidents.** Reconstructed carbon monoxide (CO) poisoning incidents in residential and marine environments through combustion product analysis, CO emission testing, ventilation and dispersion analysis, and evaluation of CO detection system performance.

Industrial and Environmental Applications

Dr. Fávero has performed failure analysis, process evaluations, and hazard assessments across additional industrial and environmental sectors.

- **Refrigeration Systems.** Led root-cause failure analyses of refrigeration system failures involving refrigerant flow, fouling, and chemical compatibility among system components. Experience

includes analysis of refrigerant behavior, lubricant interactions, material compatibility, and identification of degradation and leaching mechanisms contributing to system performance loss and failure.

- **Self-Heating and Spontaneous Combustion.** Investigated industrial materials for self-heating and spontaneous ignition hazards. Experience includes storage testing and heating analysis of materials such as wood dust, paints, adhesive tapes, and polymer dusts, including evaluation against UN Class 4.2 self-heating substance criteria.
- **Carbon Capture and Storage.** Evaluated process performance in carbon capture and storage (CCS) applications. Experience includes assessment of CO□ dissolution processes, heterogeneous reaction kinetics involving suspended mineral phases, and evaluation of carbon mineralization and sequestration performance.
- **Nuclear Industry.** Performed investigations and design reviews in the nuclear industry. Experience includes investigation of a radioisotope tracer testing protocol used in flow-loop testing and design review of an evaporator intended to reduce the volume of radioactive aqueous waste for long-term storage.
- **Flammability Testing.** Developed and built custom testing setups to measure flash points, lower and upper flammability limits (LFL and UFL), autoignition temperature, limiting oxygen concentration, and flame propagation speed. Conducted testing on evaporating fluids to determine the extent to which changing chemical compositions alter flammability characteristics. Testing was performed in accordance with ASTM E918 (Standard Practice for Determining Limits of Flammability of Chemicals at Elevated Temperature and Pressure), ASTM D93 (Standard Test Methods for Flash Point by Pensky-Martens Closed Cup Tester), ASTM E659 (Standard Test Method for Autoignition Temperature of Chemicals), and ASTM E2079 (Standard Test Methods for Limiting Oxygen Concentration in Gases and Vapors).
- **Flame Arrestors in Aviation.** Evaluated flame arrestor performance based on the standard MIL-PRF-87260B (Performance Specification: Foam Material, Explosion Suppression, Inherently Electrostatic Conductive, for Aircraft Fuel Tank).

Peer Reviews

Energy and Fuels

Langmuir