Exponent®
Engineering & Scientific Consulting

Nick Welchert, Ph.D.

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Professional Profile

Dr. Welchert uses his expertise as a chemical engineer to analyze failures and explosions related to petroleum refining, chemical processing, the maritime industry, and the mining industry. He is also a certified wildland fire investigator and uses his experience and expertise in origin and cause determination of wildland fires. He has extensive knowledge pertinent to operating and analyzing custom-built reactors, analyzing self-accelerating decompositions, semiconductor device fabrication, mining operations, refinery processes, and quantitative chemical analysis.

Dr. Welchert has expertise in refinery wastewater processing, hazardous material classification for storage and transportation, and wildland fire and structural fire investigations. Dr. Welchert is a certified drone pilot (FAA Part 107) and creates 2D and 3D models from aerial photography for photogrammetric analysis of fires, failures, and explosions. Dr. Welchert uses FTIR, XPS, and EDS to analyze the composition of materials and uses SEM, ellipsometry, and goniometry to analyze their physical properties. He investigates complex fluid systems using COMSOL Multiphysics, AFT Arrow, and other simulation software.

Prior to Exponent, Dr. Welchert received his Ph.D. in chemical engineering from the University of Southern California. He researched novel chemical vapor deposition (CVD) techniques to develop thin polymer films for biomedical implants, hydrogen production, and microfabrication. He designed and tested custom vapor delivery systems and simulated the CVD process using computational fluid dynamics to optimize the manufacture of gradient thin polymer films. While also at USC, Dr. Welchert researched CVD on liquid substrates to produce a preceramic silicon-containing membrane. He has operated, analyzed, and modified custom-built reactors and thin film deposition processes. Dr. Welchert has also worked at some of the largest open-pit mining sites in North America, which provided expertise in copper processing, mining ventilation, and high-throughput quality control.

Academic Credentials & Professional Honors

Ph.D., Chemical Engineering, University of Southern California, 2023

B.S., Chemical Engineering, University of Arizona, 2017

M.S., Chemical Engineering, University of Southern California, 2017

Licenses and Certifications

40-Hour Hazardous Waste Operation and Emergency Response Certification (HAZWOPER) (CA)

8-Hour HAZWOPER Annual Refresher

FAA Part 107 Certified Commercial Drone Pilot

FI-210, Wildland Fire Origin and Cause Determination (CA)

Certified Fire and Explosion Investigator (CFEI)

Process Mineralogy 1 for Metals Certificate from Edumine

Prior Experience

Engineering Intern, Rio Tinto Minerals, Kennecott mine, 2017

Engineering Intern, Freeport-McMoRan Oil & Gas, Technology Center, 2016

Professional Affiliations

National Fire Protection Association (NFPA)

National Association of Fire Investigators (NAFI)

International Association of Wildland Fire (IAWF)

American Institute of Chemical Engineers (AIChE)

Publications

Tabarkhoon, F., Bazmi, M., Welchert, N. A., Tsotsis, T. T., Gupta, M. (2025) One-Pot Fabrication of Silicon Carbide Thin Films via Plasma-Enhanced Chemical Vapor Deposition (PECVD) Followed by In Situ Pyrolysis. Industrial & Engineering Chemistry Research. https://doi.org/10.1021/acs.iecr.4c03786

Ott, B., Welchert, N. A., Delafontaine, L., Frajnkovič, M., Reza, A. (2024) Considerations for the safe handling and processing of unstable materials. Process Safety Progress. 1-9. doi:10.1002/prs.12652

Ott, B., Welchert, N. A., Delafontaine, L., Reza, A. (2024) Ensuring Mechanical Integrity in Liquified Petroleum Gas and Liquified Natural Gas Facilities. Paper presented at the The 34th International Ocean and Polar Engineering Conference, Rhodes, Greece, June 2024.

Ott, B., Delafontaine, L., Welchert, N. A., Dee, S., Reza, A. (2023). Ensuring natural gas infrastructure is suitable for hydrogen service. Process Safety Progress, 42, 2, 213-224.

Nguyen, B., Tabarkhoon, F., Welchert, N. A., Hu, S., Gupta, M., Tsotsis, T. (2023). Fabrication of SiC-Type Films Using Low-Energy Plasma-Enhanced Chemical Vapor Deposition (PECVD) and Subsequent Pyrolysis. Industrial & Engineering Chemistry Research, 62, 24, 9474-9491.

Welchert, N. A., Swarup, J., Gupta, R. S., Gupta, M. (2023). Branched nozzle oblique angle flow for initiated chemical vapor deposition. Journal of Vacuum Science & Technology A, 41, 033202.

Bacheller, S., Welchert, N. A., Gupta, M. (2023). Influence of Oblique Angle Deposition on Porous Polymer Film Formation. Langmuir, 39, 4, 1507–1514.

Welchert, N. A., Nguyen, B., Tsotsis, T. T., Gupta, M. (2021). Vapor Deposition of Silicon-Containing Microstructured Polymer Films onto Silicone Oil Substrates. Langmuir, 37, 47, 13859–13866.

Welchert, N. A., Cheng, C., Karandikar, P., Gupta, M. (2020). Oblique angle initiated chemical vapor

deposition for patterning film growth. Journal of Vacuum Science & Technology A, 38, 6, 063405.

Presentations

Welchert, N. A. Vapor Deposition of Silicon-Containing Microstructured Polymer Films onto Silicone Oil Substrates. Presented at the 2021 AIChE Conference, Boston, MA, United States, November 9, 2021.

Project Experience

Origin and cause investigations of large wildland fires throughout the country

Fire and explosion origin and cause investigations of structural, utility, maritime, refining, mining, and industrial incidents

Chemical processing investigations of petroleum refining and semiconductor manufacturing systems

Additional Education & Training

2018-2020 The USC Viterbi School of Engineering/Chevron Corporation University Partnership Program (USCCVX UPP) Ph.D. Fellowship in Energy Resources

Peer Reviews

International Society for Offshore and Polar Engineers, ISOPE-2025