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 has extensive knowledge pertinent to operating, analyzing, and modifying custom built reactors, semiconductor device fabrication, mining, and quantitative chemical analysis.

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.

Dr. Welchert analyzes chemical properties using FTIR, XPS, and EDS and physical properties using SEM, ellipsometry, and goniometry. He analyzes complex fluid dynamics using COMSOL Multiphysics, AFT Arrow, and other simulation. He has expertise in ventilation design, ISO 9001 quality management, and work site standards and regulations pertaining to mining and electrorefining.

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)

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

American Institute of Chemical Engineers

American Vacuum Society

Publications

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.

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.

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.

Additional Education & Training

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