

MATTHEW COBLYN

Research Associate | School of Chemical, Biological, & Environmental Engineering, Oregon State University | coblynm@oregonstate.edu

EDUCATION

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| Oregon State University – School of Chemical, Biological, and Environmental Engineering Ph.D. in Chemical Engineering “An Investigation of Multiphase Flow in Complex Microchannel Geometries for Hemodialysis Systems using Residence Time Distribution Analysis” | 2015 |
| University of California, Irvine – Department of Chemical Engineering and Material Science M.S. in Chemical Engineering | 2009 |
| Oregon State University – School of Chemical, Biological, and Environmental Engineering B.S. in Bioengineering | 2008 |

TEACHING EXPERIENCE

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| Oregon State University, Corvallis, OR Course Developer and Co-Instructor - RAPID Modular Chemical Process Intensification Boot Camp | 2019, 2022 |
| Course Developer - Introduction to Modular Chemical Process Intensification, Online Course | 2020 |
| Co-Instructor – CHE 514 Graduate Fluid Flow | 2018 |
| Instructor – CHE 514 Graduate Fluid Flow | 2017 |
| Guest Lecturer – CHE 331 Transport Phenomena I, CHE 514 Grad Fluids, CHE 520 Mass Transfer, CHE 581 Microreactor Engineering | 2012 - 2016 |

RESEARCH EXPERIENCE

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| Oregon State University, Corvallis, OR Research Associate & Lab Manager | 2015 – Current |
| <ul style="list-style-type: none">• Co-PI on “Microchannel-based Membrane-less Extraction of Li from Unconventional Lithium Sources & the Separation of REE” project funded by DOE Advanced Manufacturing Office. Collaboration with University of Pittsburgh.• Researching design, optimization, and process development of multi-material, additively manufactured heat exchangers, funded by U.S. Office of Naval Research. Collaboration with University of Tennessee, Knoxville.• Researching design of an additively manufactured, microscale-based chemical reactor for biofuel production, funded by DOE Bioenergy Technologies Office. Collaboration with Pacific Northwest National Labs and LanzaTech Inc.• Co-PI on development of a wearable therapeutic blood processing platform. Current research in the applications of hyperuricemia and thalassemia treatment, and investigating potential blood damage, device design and manufacturing, and model development.• Co-PI on AIChE RAPID project to develop high efficiency, two-phase flow extraction and separation units utilizing capillary gradient in micro-post grid architecture for chemical manufacturing, funded by DOE. Collaboration with Lubrizol Corp. and University of Pittsburgh.• Co-PI on development of microscale-based, point-of-use photoreactor for inactivation of waterborne pathogens (ex. cryptosporidium) using UVC irradiation. | |

- Researcher on reactor design and process development of a microscale-based integrated reactor-heat exchanger for application in solar thermal chemical processing, specifically synthesis of DME. RAPID Project funded by DOE Advanced Manufacturing Office. Collaboration with Pacific Northwest National Labs and STARS Technology Corp.
- Co-PI on industry sponsored project to develop high efficiency non-thermal glow discharge reactors for CO₂ conversion to chemical products and development of a microscale-based, temperature pulse reactor for ethylene polymerization.
- Researcher on development of non-thermal glow discharge reactors for conversion of biogas to hydrocarbon products, funded by DOE ARPA-E.
- Researcher on development of modular microscale-based biofilm reactors for biochemical conversion of methane to liquid fuels in distributed, remote applications, funded by DOE ARPA-E.
- Co-PI on a collaborative project with DOE Savannah River National Labs and University of South Carolina to develop a polymer-based microchannel separation unit.
- Co-advisor and thesis committee member for graduate and honors undergraduate researchers.

Oregon State University, Corvallis, OR

Graduate Research Assistant & Lab Manager

2010 – 2015

Developed microchannel-based devices for compact, long-duration hemodialysis.

- Designed microchannel devices (e.g., CAD design, material selection, defining operating criteria), developed fabrication process for UV laser micromachining and polymer hot embossing.
- Characterized microchannel devices via two-phase fluid imaging, surface characterization, mass transport evaluation, and numerical simulation.
- Developed an impulse response test loop utilizing residence time distribution theory for characterizing hydrodynamic behavior and detecting fabrication defects. Utilized Six Sigma methodology to reduce measurement error in test loop and bring process under statistical control.
- Process development and management of Jenoptik Nanoimprinter, used for polymer lamina plate fabrication.

University of California, Irvine, Irvine, CA

Graduate Research Assistant

2008 - 2009

Investigated feasibility of direct nucleation of colloidal gold nanoparticles onto the protein streptavidin. Characterized effects of GM-CSF on stimulating murine bone marrow cells to differentiate into dendritic cells and effectiveness of DNA nanoparticle transfection. Also characterized the growth and production of various recombinant *Pichia pastoris* strains for endoglucanase production.

Bayer Healthcare Pharmaceuticals, Berkeley, CA

Summer Research Intern

2007

Investigated the effects of buffer formulation component concentrations and pH levels on recombinant Factor VIII protein adsorption to negatively charged glass vials with hydrophobic and hydrophilic surfaces.

Oregon State University, Corvallis, OR

Undergraduate Research Assistant

2006 - 2007

Conducted research on biomaterial surface derivatizations and coatings to impart biocompatibility and function. Research involved synthesis of anti-thrombic block copolymers through modification of anti-coagulant drug heparin and covalently attaching it to end-activated triblock surfactants.

Oregon Health & Science University, Portland, OR

Summer Research Intern

2005 - 2006

Conducted research on development of a novel bioactive glass ionomer cement for use with braces and other dental hardware by preparing various samples and measuring physical properties and bioactive capabilities.

AWARDS AND CERTIFICATIONS

IIE Six Sigma Green Belt Certification
Life Chips IGERT Fellowship Recipient
WERC Environmental Design Competition 2008 - Group 1st Place
Dorsey and Aurelia Edwards Endowed Fund Recipient
Lloyd Covert Memorial Chemical Engineering Scholarship Recipient
Oregon State University Johnson Intern Award

PUBLICATIONS

- Reddick, I.; Shareghi, A.; Miao, Y.; Pommerenck, J.; Coblyn, M.; Yokochi, A.; Von Jouanne, A.; Jovanovic, G.; AuYeung, N. Parametric Study of Hydrocarbon Chain Growth from Methane via a Nonthermal Plasma Discharge Microreactor. *Ind. Eng. Chem. Res.* 2022, 61 (28), 10047–10057. <https://doi.org/10.1021/acs.iecr.2c01472>.
- Nguyen, C. C.; Mohamed, O. M.; Coblyn, M. Y.; Jovanovic, G. N.; Navab-Daneshmand, T. Pathogen Inactivation in Drinking Water: A Point-of-Use Microscale Reactor with Ultraviolet Irradiation. *Environmental Engineering Science* 2022. <https://doi.org/10.1089/ees.2021.0468>.
- Jovanovic, G. N.; Coblyn, M. Y.; Plazl, I. Time Scale Analysis & Characteristic Times in Microscale-Based Chemical and Biochemical Processes: Part I – Concepts and Origins. *Chemical Engineering Science* 2021, 238, 116502. <https://doi.org/10.1016/j.ces.2021.116502>.
- Jovanovic, G. N.; Coblyn, M. Y.; Plazl, I. Time Scale Analysis & Characteristic Times in Microscale-Based Bio-Chemical Processes: Part II – Bioreactors with Immobilized Cells, and Process Flowsheet Analysis. *Chemical Engineering Science* 2021, 236, 116499. <https://doi.org/10.1016/j.ces.2021.116499>.
- Manoharan, S.; Summerville, S.; Freiberg, L.; Coblyn, M.; Touma, J. G.; Jovanovic, G.; Paul, B. K. Manufacturing Process Design of a Micro-Scale Liquid-Liquid Extractor and Multi-Phase Separator. *Journal of Manufacturing Processes* 2020. <https://doi.org/10.1016/j.imapro.2020.04.034>.
- Summerville, S.; Coblyn, M.; Jovanovic, G.; Paul, B. K. Teaching Manufacturing Process Design as a Means for Competitive Advantage in Chemical Process Industries. *Procedia Manufacturing* 2020, 48, 1109–1119. <https://doi.org/10.1016/j.promfg.2020.05.152>.
- Manoharan, S.; Lee, K.; Freiberg, L.; Coblyn, M.; Jovanovic, G.; Paul, B. K. Comparing the Economics of Metal Additive Manufacturing Processes for Micro-Scale Plate Reactors in the Chemical Process Industry. *Procedia Manufacturing* 2019, 34, 603–612. <https://doi.org/10.1016/j.promfg.2019.06.168>.
- Coblyn, M.; Truszkowska, A.; Jovanovic, G. Characterization of Microchannel Hemodialyzers Using Residence Time Distribution Analysis. *Journal of Flow Chemistry* 2016, 6 (1), 53–61. <https://doi.org/10.1556/1846.2015.00041>.
- Coblyn, M. Y. An Investigation of Multiphase Flow in Complex Microchannel Geometries for Hemodialysis Systems Using Residence Time Distribution Analysis. Ph.D. Dissertation, Oregon State University, Corvallis, OR, 2015.
- Coblyn, M.; Truszkowska, A.; Mohammadi, M.; Heintz, K.; McGuire, J.; Sharp, K.; Jovanovic, G. Effect of PEO Coating on Bubble Behavior within a Polycarbonate Microchannel Array: A Model for Hemodialysis. *Journal of Biomedical Materials Research Part B: Applied Biomaterials* 2015. <https://doi.org/10.1002/jbm.b.33440>.
- Heintz, K.; Schilke, K. F.; Snider, J.; Lee, W.-K.; Truong, M.; Coblyn, M.; Jovanovic, G.; McGuire, J. Preparation and Evaluation of PEO-Coated Materials for a Microchannel Hemodialyzer. *J. Biomed. Mater. Res.* 2013, n/a-n/a. <https://doi.org/10.1002/jbm.b.33082>.

SELECTED PRESENTATIONS

2D Membrane-Less Phase Separation & Extraction Device-Part I: Implementation of Process Intensification Tools in Development, **Advanced Manufacturing and Processing (AMP) Conference**, Bethesda, Maryland, 6/2022

Developing a Platform for Therapeutic Blood Processing using Learnings from Chemical Process Intensification, **OSU School of Chemical, Biological, and Environmental Engineering Seminar Series**, Corvallis, Oregon, 10/2021

Microscale-Based, Lamina-Plate Extracorporeal Blood Processing: A Platform for Advancing Personalized Medical Therapeutics, **The 17th International Conference on Biomedical Engineering (ICBME)**, Singapore, 12/2019

Modular Chemical Process Intensification: Discovering Opportunities and Overcoming Challenges, **RAPID Institute Webinar**, Virtual, 7/2019

A DFT study of Hydrodeoxygenation Reaction Mechanism, **2018 International Conference on Advanced and Applied Petroleum, Petrochemicals, and Polymers (ICAPP)**, Bangkok, Thailand, 12/2018

Multiphase Microchannel Separation utilizing Capillary Pressure Gradients, **2018 American Institute of Chemical Engineers (AIChE) Annual Meeting**, Pittsburgh, Pennsylvania, 10/2018

“Separation Unit Operations in Microscale-Based Technology” Co-chair Reactor Design session and paper presented at **PTT Micro-Nano-Atto Technology & Engineering Conference**, Bangkok, Thailand, 3/2017

Characterization of Bio-Lamina-Plate Microreactors using Residence Time Distribution Analysis, **14th International Microreactor Technology (IMRET) Conference**, Beijing, China, 9/2016

Investigation of Microchannel Hemodialyzers using Residence Time Distribution, **3rd International Conference on Implementation of Microreactor Technology in Biotechnology (IMTB)**, Opatija, Croatia, 5/2015