

## Christopher L. Wirth

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Chemical and Biomolecular Engineering  
Case School of Engineering  
Case Western Reserve University  
Cleveland, OH

(phone) 216-645-3023  
(email) [wirth@case.edu](mailto:wirth@case.edu)  
(web) [wirthlab.org](http://wirthlab.org)  
(twitter) [@wirthlab](https://twitter.com/wirthlab)

### Research Interests

Colloid and Interface Science, Electrokinetics, Soft Matter

### Appointments

January 2020, **Assistant Professor**  
Chemical and Biomolecular Engineering Department  
Case School of Engineering  
Case Western Reserve University

2014 to 2019, **Assistant Professor**  
Chemical and Biomedical Engineering Department  
Washkewicz College of Engineering  
Cleveland State University

2013 – 2014, **Postdoctoral Scholar**  
Chemical Engineering Department  
Soft Matter, Rheology, and Technology Laboratory  
KU Leuven  
*Mentors: Jan Vermant and Michael De Volder*

2012, **Research Chemist**  
Insight Group - Automotive Coatings  
Coatings Innovation Center  
PPG  
*Mentors: Kevin Gallagher and Shelley Anna (CMU)*

### Education

2012, PhD in Chemical Engineering  
Carnegie Mellon University  
*Mentors: Dennis C. Prieve and Paul J. Sides*

2007, BS in Chemical Engineering  
University at Buffalo, The State University of New York

### Honors and Awards

- 2018 CSU Faculty Merit Recognition Award
- 2018 National Science Foundation CAREER Award
- 2017 American Chemical Society Doctoral New Investigator Award
- 2012 Ken Meyer Award for Excellence in Graduate Research
- 2012 Robert R. Rothfus Graduate Fellowship
- 2011 Roy W. Weiland Graduate Fellowship
- 2011 Carnegie Institute of Technology Bertucci Graduate Fellowship

- 2009 Elected President of the Chemical Engineering Graduate Student Association
- 2007 Achievement Rewards for College Scientists Scholarship
- 2007 Carnegie Institute of Technology Dean's Fellowship

## Professional Service

- 2019 **Chair**, AIChE Annual Meeting “Particulate and Multiphase Flows: Emulsions, Bubbles, and Droplets”
- 2019 **Chair**, AIChE Annual Meeting “Interfacial Transport Phenomena”
- 2019 **Chair**, AIChE Annual Meeting “Active Colloidal Systems”
- 2019 **Co-Chair**, AIChE Annual Meeting “Soft Matter Electrokinetics”
- 2019 **Co-Chair**, AIChE Annual Meeting “Particulate and Multiphase Flows: Colloids and Grains”
- 2018 **Chair**, AIChE Annual Meeting “Soft Matter Electrokinetics”
- 2018 **Co-Chair**, AIChE Annual Meeting “Active Colloids”
- 2018 **Co-Chair**, 92<sup>nd</sup> ACS Colloids and Surface Science Symposium, “Colloidal and Surface Forces”
- 2017 - **NSF REU Mentor**, REU: Synthesis, Assembly and Characterization of Soft Matter Systems, Cleveland State University Department of Physics
- 2017 **Chair**, American Institute of Chemical Engineers Annual Meeting (AIChE) Annual Meeting “In Honor of Dennis Prieve's Retirement – 1 & 2”
- 2017 **Chair**, AIChE Annual Meeting “Active Colloidal Systems”
- 2017 **Co-Chair**, AIChE Annual Meeting “Emulsions and Foams”
- 2016 **Chair**, American Institute of Chemical Engineers Annual Meeting (AIChE), “Soft Matter Electrokinetics: Particles, Drops, and Bubbles”
- 2016 **Chair**, AIChE Annual Meeting “Active Colloidal Systems 1”
- 2016 **Co-Chair**, AIChE Annual Meeting “Emulsions and Foams”
- 2015 **Chair**, AIChE Annual Meeting “Soft Matter Electrokinetics: Particles, Drops, and Bubbles”
- 2015 **Panelist**, AIChE Annual Meeting Young Professionals Panel
- 2015 **Co-Chair**, 89<sup>th</sup> ACS Colloids and Surface Science Symposium Poster Session
- 2015 **Judge**, Choose Ohio First Poster Session
- 2015 - **Proposal Reviewer** for *NASA, ACS, BSF, and NSF*.
- 2014 **Judge**, AES/AIChE Annual Meeting Poster Session
- 2014 **Co-Chair**, AIChE Annual Meeting “Soft Matter Electrokinetics: Particles, Drops, and Bubbles”
- 2014 **Meeting Chair**, The Gordon Research Seminar on Colloidal, Macromolecular, and Polyelectrolyte Solutions
- 2013 **Instructor**, 14<sup>th</sup> European School on Rheology
- 2013 **Co-Chair**, AIChE Annual Meeting “Electrokinetic behavior of Micro- and Nano-Particles: Directed Assembly Under Electric Fields”
- 2013 **Judge**, AES/AIChE Annual Meeting Poster Session
- 2012 - **Reviewer** for *Physical Review E, Industrial and Engineering Chemistry Research, Langmuir, Electrophoresis, Colloids and Surfaces A, Soft Matter, Biomicrofluidics, Energy and Fuels, AIChE Journal, Journal of Colloid and Interface Science, and Materials*.
- 2012 **Chair**, AIChE Annual Meeting “Electrokinetic behavior of Micro- and Nano-Particles: Directed Assembly Under Electric Fields”

## Publications

- 21) **Influence of Depletants on the Clustering of Active Janus Colloids**, M Kalil, NR Baumgartner, SD Ryan, and CL Wirth, *in preparation*
- 20) **Single and Ensemble Response of Colloidal Ellipsoids to a Nearby ac Electrode**, J Yan, A Rashidi, and CL Wirth, *under review*
- 19) **Efficient sizing of single layer graphene oxide with optical microscopy under ambient conditions**; Q Luo, CL Wirth, EB Pentzer, *Carbon (2020) 157, 395-401*
- 18) **Charged Nanoparticles Quench the Propulsion of Active Janus Colloids**; MW Issa, NR Baumgartner, M Kalil, SD Ryan, and CL Wirth, *ACS Omega (2019) 4, (8), 13034-13041*
- 17) **A light scattering model for total internal reflection microscopy of geometrically anisotropic particles**; A Doicu, AA Vasilyeva, DS Efremenko, CL Wirth, T Wriedt, *Journal of Modern Optics (2019): 1-13*
- 16) **Purification and Assembly of DNA-Stabilized Boron Nitride Nanotubes into Aligned Films**; VR Kode, ME Thompson, C McDonald, J Weicherding, T Dobrila, PS Fodor, CL Wirth, G Ao, *ACS Applied Nano Materials (2019) 2, (4), 2099-2105*
- 15) **Influence of cap weight on the motion of a Janus particle very near a wall**; A Rashidi, S Razavi, and CL Wirth, *under revision - preprint available on arXiv*
- 14) **Local measurement of Janus particle cap thickness**; A Rashidi, MW Issa, I Martin, A Avishai, S Razavi, and CL Wirth, *ACS Applied Materials and Interfaces (2018) 10 (37), 30925 - 30929*
- 13) **Combined effect of surface oxidation and residual alcohol on the mechanics of a multiwall carbon nanotube laden interface**; WD Ivancic and CL Wirth, *Colloids and Surfaces A: Physicochemical and Engineering Aspects (2018) 551, 42 - 49*
- 12) **Motion of a Janus particle very near a wall**; A Rashidi and CL Wirth, *Journal of Chemical Physics (2017) 147, 224906*
- 11) **Response of a doublet to a nearby dc electrode of uniform potential**; CL Wirth and Sri Harsha Nuthalapati, *Physical Review E (2016) 94, 042614*
- 10) **Langmuir monolayer characterization via polymer microtensiometers**; P Gijzenbergh, M Pepicelli, CL Wirth, J Vermant and R Puers, *Sensors & Actuators: A. Physical (2015) 229, 110 – 117*
- 9) **Fabrication of planar colloidal clusters with template-assisted interfacial assembly**; CL Wirth, MFL De Volder, and J Vermant, *Langmuir (2015) 31, (5), 1632 - 1640.*
- 8) **A polymer microdevice for tensiometry of insoluble components**; P Gijzenbergh, M Pepicelli, CL Wirth, J Vermant and R Puers, *Procedia Engineering (2014) 87, 80 – 83*
- 7) **Weak electrolyte dependence in the repulsion of colloids at a water-oil interface**; CL Wirth, EM Furst and J Vermant, *Langmuir (2014) 30, (10), 2670 - 2675.*
- 6) **Electrolyte dependence of particle motion near an electrode during ac polarization**; CL Wirth, PJ Sides and DC Prieve, *Physical Review E (2013) 87, 032302*
- 5) **Mechanisms for directed assembly of colloidal particles in two dimensions by application of electric fields**; PJ Sides, CL Wirth and DC Prieve. in Electrophoretic Deposition of Nanomaterials, 3-72. Eds. JH Dickerson and AR Boccaccini. Springer, 2012.
- 4) **Single and pairwise motion of particles near an ideally polarizable electrode**; CL Wirth, RM Rock, PJ Sides and DC Prieve, *Langmuir (2011) 27, (1), 9781-9791.*

- 3) **The imaging ammeter;** CL Wirth, PJ Sides, DC Prieve, *Journal of Colloid and Interface Science* (2011) 357, (1), 1-12.
- 2) **An imaging ammeter for electrochemical measurements;** PJ Sides, CL Wirth, DC Prieve, *Electrochemical and Solid-State Letters* (2010) 13, (8), F10-F12.
- 1) **2D assembly of colloidal particles on a planar electrode;** DC Prieve, PJ Sides, CL Wirth, *Current Opinion in Colloid & Interface Science* (2010) 15, (3), 160-174.

## Selected Invited Presentations

- 10) **Complex Colloidal Particles Near Boundaries**  
CL Wirth; Department of Chemical and Biological Engineering, Colorado School of Mines, September 2019
- 9) **Brownian Dynamic Simulation and Mapping Evanescent Wave Scattering from Anisotropic Particles**  
A Rashidi and CL Wirth; Bremen Workshop on Light Scattering, Universität Bremen (Germany), March 2019
- 8) **Non-invasive measurement of kinematics and rheology in a drying paint**  
CL Wirth; PPG, March 2019
- 7) **Influence of cap weight on the motion of a Janus particle very near a wall**  
A Rashidi and CL Wirth; College of Polymer Science and Polymer Engineering Seminar, University of Akron, December 2018
- 6) **Dynamics of colloidal particles in a fluid: Applications in rheology and surface force measurement**  
CL Wirth; Sherwin Williams, September 2018
- 5) **The motion of a Janus particle very near a wall**  
A Rashidi and CL Wirth; Chemical Engineering Department, Colloids, Polymers, and Surfaces Seminar, Carnegie Mellon University, November 2017
- 4) **Brownian dynamics of a spherical Janus particle near a boundary as a tool to investigate TIRM**  
A Rashidi and CL Wirth; Chemical and Biomolecular Engineering Department, Complex Fluids Engineering Seminar, University of Pennsylvania, June 2017
- 3) **Brownian dynamics of a spherical Janus particle near a boundary as a tool to investigate TIRM**  
A Rashidi and CL Wirth; Chemical Engineering Department, Complex Fluids Engineering Seminar, Lehigh University, June 2017
- 2) **Total Internal Reflection Microscopy of a Janus Sphere**  
A Rashidi and CL Wirth; Chemical and Biomolecular Engineering Department, University of Toledo, April 2017
- 1) **Total Internal Reflection Microscopy of a Janus Sphere**  
A Rashidi and CL Wirth; Chemical and Biomolecular Engineering Department, Ohio University, February 2017

## Students Supervised as Research Advisor

### *Doctoral students*

- 29) **Jiarui Yan**, PhD with specialization in Chemical Engineering (currently enrolled)
- 28) **Selwin Varghese**, PhD with specialization in Chemical Engineering (currently enrolled)
- 27) **Aidin Rashidi**, PhD with specialization in Chemical Engineering (currently enrolled)

### *Masters students*

- 26) **Lilavathi M Gould**, MS Thesis in Chemical Engineering (currently enrolled)
- 25) **Sri Harsha Nuthalapati**, MS Thesis in Chemical Engineering (graduated spring 2018)
- 24) **Kevin Gardella**, MS in Physics (currently enrolled)
- 23) **Mohammed Khalil**, MS Thesis in Chemical Engineering (currently enrolled)
- 22) **Michael March**, MS Project in Chemical Engineering (currently enrolled)
- 21) **Nicholas Turner**, MS Project in Chemical Engineering (graduated fall 2015)
- 20) **Cornelius Obasanjo**, MS Thesis in Chemical Engineering (graduated fall 2016)
- 19) **Selwin Varghese**, MS Thesis in Chemical Engineering (graduated fall 2017)
- 18) **Venkateswara Rao Kode**, MS Project in Chemical Engineering (graduated spring 2017)
- 17) **Mehul Gamara**, MS Project in Chemical Engineering (graduated fall 2017)
- 16) **William Ivancic**, MS Thesis in Chemical Engineering (graduated fall 2017)
- 15) **Jiarui Yan**, MS Thesis in Chemical Engineering (graduated in summer 2018)
- 14) **William Tuttle**, MS Project in Chemical Engineering (graduated spring 2017)

### *Undergraduate students*

- 13) **Sarah Buchahine**, BS in Chemical Engineering (Honors, currently enrolled)
- 12) **Kenneth Gregg**, BS in Physics (University of Akron)
- 11) **Naik Yusifi**, BS in Chemical Engineering (currently enrolled)
- 10) **Marissa Trivisonno**, BS in Chemical Engineering (currently enrolled)
- 9) **Marola Issa**, BS in Chemical Engineering (currently enrolled)
- 8) **TJ Markiewicz**, BS in Biomedical Engineering (Rowan University)
- 7) **Payton Lewis**, BS in Chemical Engineering (Honors, graduated spring 2018)
- 6) **Nandini Padaraju**, BS in Chemical Engineering (currently enrolled)
- 5) **John Juchnowski**, BS in Chemical Engineering (graduated spring 2017)
- 4) **Jason Wolf**, BS in Mechanical Engineering (graduated fall 2015)
- 3) **Ian Burns**, BS in Mechanical Engineering (currently enrolled)
- 2) **Richard Schmitt**, BS in Chemical Engineering (graduated spring 2016)
- 1) **William Ivancic**, BS in chemical engineering (graduated spring 2016)

### **Students Supervised as Committee Member**

- 9) **Jeremy Loss**, MS BME Thesis (graduated spring 2019)
- 8) **Kara Ufuoma**, MS ChemE Thesis (graduated summer 2018)
- 7) **Kevin Otto**, MS ChemE Thesis (graduated spring 2015)
- 6) **Tara Diba**, MS BME Thesis (graduated fall 2015)
- 5) **James Deyling**, MS ChemE Thesis (graduated fall 2016)
- 4) **Aaron Moran**, DRE ChemE (graduated 2018)
- 3) **Richard Schmitt**, MS ChemE (graduated 2018)
- 2) **Supriya Upadyay**, MS ChemE (graduated 2018)
- 1) **Claudine Lacdao**, MS ChemE (graduated 2017)

### **Courses Taught**

*<sup>s</sup>new course*

- 5) **ESC720** Research Communications (fall 17, fall 18)
- 4) **<sup>s</sup>CHE444/544** Colloidal and Interfacial Phenomena (fall 14, fall 16, fall 18, fall 19)
- 3) **CHE506** Advanced Transport Phenomena (spring 16, spring 18, spring 19)
- 2) **ESC301** Fluid Mechanics (summer 15, spring 17, spring 18)

- 1)     **\$CHE594/694**            Colloidal Hydrodynamics and Electrokinetics (fall 15)

## **Outreach**

- 1)     **Everyday Nano**        Program seeking to have high school students learn about the broad area of Colloid and Interfacial Science and subsequently focus effort on learning about one specific product that students interact with on a daily basis. The initial offering of the program in August 2016 was held at MC<sup>2</sup>STEM high school. MC<sup>2</sup>STEM is a Cleveland Metropolitan School District (CMSD) high school with its 11th and 12th grade campus located at Cleveland State University. The MC<sup>2</sup>STEM curriculum is structured around providing students with interdisciplinary and hands-on learning experiences.

## **External Research Support**

- 7)     **Amount**            \$537,470 (Wirth: \$233,447.00)  
       **Agency**        National Science Foundation  
       **Title**            GOALI: Collaborative Research: Non-invasive measurement of kinematics and rheology in a drying complex fluid  
       **Role**            Lead PI  
       **Duration**        January 1<sup>st</sup>, 2020 - December 31<sup>st</sup>, 2022
- 6)     **Amount**            \$16,394  
       **Agency**        PPG Industries  
       **Title**            Developing the Variable Angle Inspection Microscope (VAIM) to measure kinematics of drying paint  
       **Role**            Lead PI  
       **Duration**        June 1<sup>st</sup>, 2019 – December 31<sup>st</sup>, 2019
- 5)     **Amount**            \$20,000  
       **Agency**        Cleveland Foundation  
       **Title**            Internet of Things (IoT) Enabled Chemical Analysis (Role: PI, with Emily Pentzer, Chemistry Department, Case Western Reserve University)  
       **Role**            Co-PI  
       **Duration**        January 1<sup>st</sup>, 2019 – December 31<sup>st</sup>, 2019
- 4)     **Amount**            \$500,000 (+ \$31,185 as NSF INTERN supplement)  
       **Agency**        National Science Foundation  
       **Title**            CAREER: Interrogating dense anisotropic colloidal suspensions with SMR-TIRM  
       **Role**            Lead PI  
       **Duration**        September 1<sup>st</sup>, 2018 – August 31<sup>st</sup>, 2023
- 3)     **Amount**            \$61,181  
       **Agency**        PPG Industries  
       **Title**            Development of a Particle Based Non-Invasive Inspection Technique for Paint – Phase II  
       **Role**            Lead PI  
       **Duration**        January 1<sup>st</sup>, 2018 – December 31<sup>st</sup>, 2018

- 2) **Amount** \$110,000  
**Agency** American Chemical Society Petroleum Research Foundation  
**Title** Microstructure and Transport of Nanoparticle Laden Foams in Porous Media  
**Role** Lead PI  
**Duration** September 1<sup>st</sup>, 2017 – August 31<sup>st</sup>, 2020 (NCE)
- 1) **Amount** \$59,710  
**Agency** PPG Industries  
**Title** Development of a Particle Based Non-Invasive Inspection Technique for Paint – Phase I  
**Role** Lead PI  
**Duration** January 1<sup>st</sup>, 2017 – December 31<sup>st</sup>, 2017

### **University Service**

- 22) **Graduate Admission Committee** (fall 2019 - )  
21) **College of Engineering Ad-hoc Diversity Committee** (spring 2019)  
20) **University Space Committee** (fall 2018 – spring 2019)  
19) **College of Engineering Dean’s Diversity Council** (fall 2018 – spring 2019)  
18) **ChBME Qualifier Committee**, (fall 2018 – spring 2019)  
17) **Textbook Adoption Committee**, (spring 2018)  
16) **Search Committee**, Lecturer (spring – summer 2015)  
15) **Search Committee**, Advancement Officer (fall 2015 – spring 2016)  
14) **Search Committee**, AVP for Research (spring 2016)  
13) **ESC120 Curriculum Committee** (spring – summer 2015)  
12) **Dean’s Ad-hoc Committee** (spring – summer 2015)  
11) **Graduate Student Award Review Committee** (spring 2016)  
10) **Department Secretary** (fall 2014 - spring 2016)  
9) **Bell Lectureship/Seminar Series Planning Committee** (fall 2016 – fall 2019)  
8) **University Research Council** (fall 2016 – spring 2019)  
7) **Patent Review Committee** (fall 2016 – spring 2019)  
6) **Retreat Planning Ad-hoc Committee** (summer 2015 & 2016)  
5) **New Engineering Building Renovation Sub-Group** (fall 2014)  
4) **College of Engineering Research Working Group** (fall 2016)  
3) **College of Engineering Graduate Student Working Group** (fall 2015 – spring 2016)  
2) **Engineering Student Recruitment Committee** (spring 2015)  
1) **Reviewer for Undergraduate Research Award** (spring 2016)