Diego Becerra

Department of Chemical Engineering, Universidad de Concepción

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Edmundo Larenas 219 – Concepción, Chile

Research Focus

Simulation and theory in transport phenomena of complex fluids and soft materials, including the rheology of polymer melts and solutions, liquid crystal polymer systems, polycatenanes, and biopolymers in nanoconfinement, aim to advance our understanding of their structural and dynamic properties, as well as their potential applications.

Education

Ph.D., Department of Chemical Engineering, Universidad de Concepción 2017–2022

B.Sc. (Professional qualification), Department of Chemical Engineering, Universidad de Concepción 2010–2016

Professional Experience

Assistant Professor (profile), Department of Chemical Engineering, Universidad de Concepción 2024–Present

Post Doctoral Scholar (Hall Research Group), William G. Lowrie Department of Chemical and Biomolecular Engineering, The Ohio State University 2022–2023

Honors & Awards

Outstanding Post-Doctoral Fellow (Chemical Engineering). William G. Lowrie Department of Chemical and Biomolecular Engineering. The Ohio State University. *American Institute of Chemists Foundation* 2023

Society of Rheology Postdoc Poster Award runner up with "Polymer Rheology Predictions from First Principles using the Slip Link Model" 2022

Doctor of Engineering Sciences (Chemical Engineering) degree obtained with highest distinction. 2022

Chemical Engineering degree obtained with highest distinction. 2016

Publications

Published in peer-reviewed journals

[1] Biaxiality and anisotropic thermal transport in side-chain liquid crystal elastomers with tunable mesogen attachment
Diego Becerra, Gabriel Schiappacasse-Parra, José Matías Garrido
The Journal of Chemical Physics 164.13 (2026), AIP Publishing
DOI: https://doi.org/10.1063/5.0322402

[2] Slip-link model predictions for the flow of entangled melts of star-branched and linear chains of similar span length
Maria Katzarova, Andrés Córdoba, **Diego Becerra**, Jay D Schieber
Rheologica Acta 65 (2026), pp. 409–418, Springer
DOI: https://doi.org/10.1007/s00397-026-01560-z

[3] Slip-Link Theory Predicts Entangled, Star-Branched Relaxation Measurably Different from Tube Model Predictions
Maria Katzarova, **Diego Becerra**, Andrés Córdoba, Konstantin Taletskiy, Jay D Schieber
Macromolecules 59.1 (2025), pp. 564–574, ACS Publications
DOI: https://doi.org/10.1021/acs.macromol.5c01583

[4] Stable upstream swimming of a swarm of puller microswimmers
Andrés Córdoba, **Diego Becerra**, Jay D Schieber
Physics of Fluids 37.6 (2025), p. 061704, AIP Publishing

DOI: https://doi.org/10.1063/5.0275436

[5] Reëntanglement Dynamics in Polymer Melts Can Be Explained by Fast Dangling End Retraction without Resorting to Nonuniversality
Andrés Córdoba, **Diego Becerra**, Jay D Schieber
ACS Macro Letters 14.3 (2025), pp. 385–390, ACS Publications
DOI: https://doi.org/10.1021/acsmacrolett.4c00809

[6] Effect of charge inversion on the electrokinetic transport of nanoconfined multivalent ionic solutions
Andrés Rojano, **Diego Becerra**, Jens H Walther, Shaurya Prakash, Harvey A Zambrano
Physics of Fluids 36.10 (2024), p. 102025, AIP Publishing
DOI: https://doi.org/10.1063/5.0227719

[7] Role of Underlying Substrates on the Interfacial Thermal Transport in Supported Graphene Nanochannels: Implications of Thermal Translucency
Diego Becerra, Jens H. Walther, Harvey A. Zambrano
Nano Letters 24.39 (2024), pp. 12054–12061, ACS Publications (**Featured in Front Cover**)
DOI: https://doi.org/10.1021/acs.nanolett.4c02106

[8] Single-molecule analysis of solvent-responsive mechanically interlocked ring polymers and the effects of nanoconfinement from coarse-grained simulations
Diego Becerra, Alexander R. Klotz, Lisa M. Hall
The Journal of Chemical Physics 160.11 (2024), p. 114906, AIP Publishing
DOI: https://doi.org/10.1063/5.0191295

[9] Conformational variability of intrinsically isotropic polymers with varying stiffness immersed in nematogenic solvents
Diego Becerra, Pranav R. Jois, Lisa M. Hall
Polymer 295 (2024), p. 126774, Elsevier
DOI: https://doi.org/10.1016/j.polymer.2024.126774

[10] Impact of Molecular-level Structural Disruption on Relaxation Dynamics of Polymers with End-on and Side-on Liquid Crystal Moieties
Diego Becerra, Yang Xu, Xiaoguang Wang, Lisa M. Hall
ACS Nano 17.24 (2023), pp. 24790–24801, ACS Publications
DOI: https://doi.org/10.1021/acsnano.3c05354

[11] Water flow in a polymeric nanoslit channel with graphene and hexagonal boron nitride wall coatings: An atomistic study
Diego Becerra, Andrés Córdoba, Jens H. Walther, Harvey A. Zambrano
Physics of Fluids 35.10 (2023), p. 102009, AIP Publishing
DOI: https://doi.org/10.1063/5.0165657

[12] Coarse-grained modeling of polymers with end-on and side-on liquid crystal moieties: Effect of architecture
Diego Becerra, Pranav R. Jois, Lisa M. Hall
The Journal of Chemical Physics 158.22 (2023), p. 224901, AIP Publishing
DOI: https://doi.org/10.1063/5.0152817

[13] Examination of Nonuniversalities in Entangled Polymer Melts during the Start-Up of Steady Shear Flow
Diego Becerra, Andrés Córdoba, Jay D. Schieber
Macromolecules 54.17 (2021), pp. 8033–8042, ACS Publications (**Featured in Front Cover**)
DOI: https://doi.org/10.1021/acs.macromol.1c00156

[14] Polymer rheology predictions from first principles using the slip-link model
Diego Becerra, Andrés Córdoba, Maria Katzarova, Marat Andreev, David C. Venerus, Jay D. Schieber
Journal of Rheology 64.5 (2020), pp. 1035–1043, The Society of Rheology
DOI: https://doi.org/10.1122/8.0000040

[15] Water flow enhancement in amorphous silica nanochannels coated with monolayer graphene
Enrique Wagemann, **Diego Becerra**, Jens H. Walther, Harvey A. Zambrano
MRS Communications 10.3 (2020), pp. 428–433, Cambridge University Press
DOI: https://doi.org/10.1557/mrc.2020.53

Contributed Talks

Presentations are listed in reverse chronological order, and the presenting author is in bold.

[1] Slip-link and tube models make different predictions about entangled, star-shaped polymer relaxation
Jay D. Schieber, Andrés Córdoba, Maria Katzarova, and Diego Becerra, Flagship Workshop: Structure, Stress, Strain & Stretching Flows; Prato, Italy; June 19, 2025

[2] Relation between Structural Disruption and Memory Effects in Side-Chain Liquid Crystal Elastomers Fracture of Soft Polymeric Materials
Diego Becerra, Gabriel Schiappacasse, and José M. Garrido, APS Global Physics Summit; Anaheim, United States; March 20, 2025

[3] Probing the relationship between wall misalignment and water transport properties in sub-nm hexagonal boron nitride slit channels
Enrique Wagemann, Elton Oyarzúa, Diego Becerra, and Harvey Zambrano, 77th Annual Meeting of the Division of Fluid Dynamics; Salt Lake City, United States; November 26, 2024

[4] Coarse-grained simulations of side chain liquid crystal polymers with different types of attachments
Diego Becerra and **Lisa M. Hall**, AIChE Annual Meeting; Orlando, United States; November 6, 2023

[5] Effect of the mesogenic type of attachment and composition on the structural and viscoelastic behavior of side-chain liquid crystal polymer systems
Diego Becerra and Lisa M. Hall, APS March Meeting; Las Vegas, United States; March 7, 2023

[6] Rheology of linear polymer melts with end-on and side-on liquid crystal moieties in different phases: Effects of composition and thermodynamical state on relaxation dynamics
Diego Becerra and Lisa M. Hall, Society of Rheology 93rd Annual Meeting; Chicago, United States; October 11, 2022

[7] Examination of non-universalities in entangled polymer melts and solutions during the startup of steady shear flow
Diego Becerra, **Andrés Córdoba**, and Jay D. Schieber, Society of Rheology 93rd Annual Meeting; Chicago, United States; October 10, 2022

[8] A Coarse-Grained Model for Side-Chain Liquid Crystalline Linear Polymers
Diego Becerra and Lisa M. Hall, 52nd Midwest Theoretical Chemistry Conference; Columbus, United States; June 3, 2022

[9] Examination of non-universalities in entangled polymer melts and solutions during the startup of steady shear flow
Jay D. Schieber, Diego Becerra, and Andrés Córdoba, APS March Meeting; Chicago, United States; March 17, 2022

[10] Predicting Several Seconds of the Relaxation Dynamics of an Entangled Polymer Melt from a Few Nanoseconds of Atomistic Molecular Dynamics
Diego Becerra, Andrés Córdoba, and Jay D. Schieber, APS March Meeting; Chicago, United States; March 15, 2022

[11] Effect of Interfacial Thermal Transport on Water Flow in Graphene Nanochannels
Diego Becerra, Jens H. Walther, and Harvey A. Zambrano, APS March Meeting (virtual); United States; March 16, 2021

[12] Effect of Underlying Substrate on Interfacial Heat Transfer in Graphene Channels
Diego Becerra, Jens H. Walther, and Harvey A. Zambrano, 73rd Annual Meeting of the American Physical Society Division of Fluid Dynamics (virtual); Chicago, United States; November 23, 2020

[13] Effect of Charge Inversion on Electroosmotic Transport in Nanochannels
Andrés Rojano, Diego Becerra, Jens H. Walther, and Harvey A. Zambrano, 73rd Annual Meeting of the American Physical Society Division of Fluid Dynamics (virtual); Chicago, United States; November 23, 2020

[14] Hydrodynamics in a Polymeric Nanoslit Pore with Graphene Wall Coating: An Atomistic Study
Diego Becerra, Andrés Córdoba, Jens H. Walther, and Harvey A. Zambrano, MRS Fall Meeting & Exhibit; Boston, United States; December 6, 2019

[15] Hydrodynamics in a Polymeric Nanoslit Pore with Graphene and Hexagonal Boron Nitride Wall Coatings: An Atomistic Study
Diego Becerra, Andrés Córdoba, Jens H. Walther, and Harvey A. Zambrano, 72nd Annual Meeting of the American Physical Society Division of Fluid Dynamics; Seattle, United States; November 26, 2019

[16] Molecular Dynamics study of the hydrodynamics in a polymeric slit channel with graphitic wall coating
Diego Becerra, Andrés Córdoba, and Harvey A. Zambrano, 71st Annual Meeting of the American Physical Society Division of Fluid Dynamics; Atlanta, United States; November 19, 2018

Contributed Posters

Posters are listed in reverse chronological order and the presenting author is in bold.

[1] Self-consistency and speed up of constraint release dynamics for star-branched polymers
Maria Katzarova, Andrés Córdoba, Diego Becerra, and Jay D. Schieber, 21st NATIONAL SYMPOSIUM POLYMERS 2025; Kazanlak, Bulgaria; July 1, 2025

[2] Polymer rheology predictions from first principles using the slip-link model
Diego Becerra, Andrés Córdoba, Maria Katzarova, Marat Andreev, David C. Venerus, and Jay D. Schieber, Society of Rheology 93rd Annual Meeting; Chicago, United States; October 12, 2022

[3] The Importance of Non-Universalities in Entangled Polymer Melts During the Startup of Steady Shear Flow
Diego Becerra, Andrés Córdoba, and Jay D. Schieber, APS March Meeting (virtual); United States; March 17, 2021

Teaching Experience

Instructor, FI 540747, FI 4146035, FI 4219071, *Ingeniería en Materia Condensada Blanda (Soft Matter) y Reología*, Graduate course, Universidad de Concepción
2025-II

Instructor, FI 540722, FI 406203, FI 4219041, *Fenómenos de Transporte*, Graduate course, Universidad de Concepción
2025-I, 2026-II

Instructor, FI 540265, *Mecánica de Fluidos*, Undergraduate course, Universidad de Concepción
2024-II

Instructor, FI 540353, *Taller de Integración II*, Undergraduate course, Universidad de Concepción
2024-II, 2025-II

Instructor, FI 540264, *Termodinámica*, Undergraduate course, Universidad de Concepción
2024-I, 2025-I, 2026-I

Instructor, FI 540261, *Laboratorio de Procesos Químicos*, Undergraduate course, Universidad de Concepción
2024-I

Teaching (cover lessons), CHBE 3508, *Thermodynamics: Lectures on the Thermodynamics of Multicomponent Mixtures*, Undergraduate course, The Ohio State University
Spring 2023

Teaching (cover lessons), CHBE 8808, *Advanced Thermodynamics: Lectures on Statistical Mechanics*, Graduate course, The Ohio State University
Fall 2022

Thesis Supervision and Committee Work

Undergraduate Thesis Committee Member, Nicolás Díaz Inostroza, "PREDICCIÓN DEL EQUILIBRIO MULTIFÁSICO LÍQUIDO-LÍQUIDO-LÍQUIDO MEDIANTE EL USO DE MODELOS DE COEFICIENTES DE ACTIVIDAD" — 2026
Ingeniería Civil Química, Universidad de Concepción

Undergraduate Thesis Committee Member, Montserrat Pérez Silva, "Modelo CDF calibrado para un sistema modular de producción de energía a partir de hidrógeno con celda combustible tipo PEM de 60 kW nominal" — 2025
Ingeniería Civil Química, Universidad de Concepción

Undergraduate Thesis Committee Member, Mario Labraña Rosales, "Diseño racional de catalizadores NiO–Nb para aplicaciones energéticas mediante síntesis verde asistida por extracto de Aloe vera" — 2025
Ingeniería Civil Química, Universidad de Concepción

Undergraduate Thesis Committee Member, Amapola Ulloa Mancilla, "TENSIOMETRÍA EN MEZCLAS DE BIOCOMBUSTIBLES" — 2025
Ingeniería Civil Química, Universidad de Concepción

Doctoral Candidacy Committee Member, Daylenis Pérez Pérez, "Estudio de la exfoliación líquida de MoS2 asistida por microondas para la producción de nanoláminas y su integración en hidrogeles multifuncionales con aplicación en el tratamiento de heridas" 2025
Ingeniería Civil Química, Universidad de Concepción

Undergraduate Thesis Committee Member, Mario Labraña Rosales, "Diseño racional de catalizadores NiO–Nb para aplicaciones energéticas mediante síntesis verde asistida por extracto de Aloe vera" 2025
Ingeniería Civil Química, Universidad de Concepción

Undergraduate Thesis Committee Member, Catalina Cifuentes Salinas, "Estudio de factibilidad técnico-económica para implementación de una centrífuga trifásica en PTE de Refinería Biobío" 2025
Ingeniería Civil Química, Universidad de Concepción

Undergraduate Thesis Committee Member, Francisca Carrasco Esparza, "Obtención de un barniz con propiedades ignifugas mediante la adición de nanofibras de celulosa fosforiladas" 2025
Ingeniería Civil Química, Universidad de Concepción

Undergraduate Thesis Committee Member, Antonia Carrasco Hernández, "Evaluación técnica de la elaboración de membranas revalorizadas desde membranas desechadas de osmosis inversa para el tratamiento del agua gris" 2025
Ingeniería Civil Química, Universidad de Concepción

Undergraduate Thesis Committee Member, Daniel Burgos Alarcón, "THERMODYNAMIC CONSISTENCY TEST FOR FLUID PHASES IN EQUILIBRIUM IMPLEMENTED IN PYTHON" 2025
Ingeniería Civil Química, Universidad de Concepción

Undergraduate Thesis Committee Member, Paula Soto Montecinos, "Producción y caracterización de películas de nanocelulosa sulfatada aditivadas con cationes metálicos" 2025
Ingeniería Civil Química, Universidad de Concepción

Undergraduate Thesis Committee Member, José Campos Castro, "Análisis del rendimiento de un sistema de electrodiálisis con membrana catiónica para la recuperación de hidróxido de litio a partir de cloruro de litio" 2025
Ingeniería Civil Química, Universidad de Concepción

Undergraduate Thesis Supervisor, Maximiliano Sepúlveda Irarrázabal, "CFD-Based Studies and Model Development for Top-Blown Rotary Converters (TBRC)" 2025
Ingeniería Civil Química, Universidad de Concepción

Master's Thesis Committee Member, Pablo Felipe Caniu Villablanca, "Análisis y validación de un modelo molecular de grafeno utilizando potencial Tersoff polarizable mediante simulaciones de dinámica molecular" 2024
Ingeniería Civil Mecánica, Universidad de Concepción

Undergraduate Thesis Committee Member, Manuel Astroza Olivella, "Desarrollo de estructuras metálicas porosas, para aplicación en soportes de celdas de combustible de óxido sólido" 2024
Ingeniería Civil de Materiales, Universidad de Concepción

Undergraduate Thesis Committee Member, Johairo Núñez Aguayo, "Estudio de la interacción de nanofibra de celulosa con nanopartículas de lignina" 2024
Ingeniería Civil Química, Universidad de Concepción

Mentoring Experience (Advisees)

1 current Doctoral program graduate student: Daylenis Pérez (coadvisor), Universidad de Concepción)

2 current Master's program undergraduate students: Gabriel Schiappacasse (started 2025-I, Universidad de Concepción); Vincenzo Massoglia (started 2025-I, Universidad de Concepción)

1 current undergraduate student in the course Investigación para Pregrado: Nicolás Fuentes (2026-I, Universidad de Concepción)

3 former undergraduate researchers: Claudio Vera (2025-II, Investigación para Pregrado, Universidad de Concepción) Fesume Hailu (fall 2022, The Ohio State University; next position at JP Morgan Chase & Co.); Pranav Jois (summer 2022-fall 2023, The Ohio State University; next position at College of Literature, Science, and the Arts, University of Michigan as Ph.D. student)

1 former high school research students: Alasdair DeLong (summer 2023, The Ohio State University)

Participation in Research Projects

[1] EXAMINATION OF CHEMISTRY NONUNIVERSALITIES IN NONLINEAR RHEOLOGY: INSIGHTS FROM MULTISCALE MODELING FOR OPTIMIZED ADDITIVE POLYMER MANUFACTURING FONDECYT Iniciación Nº 11261807. ANID; Chile, 2026–2029.
Role: **Principal Investigator**

[2] Relation Between Structural Disruption And Memory Effects In Side-chain Liquid Crystal Elastomers: A Molecular Modeling Approach. FONDECYT Nº 3240676. ANID; Chile, 2024–2026.
Role: **Principal Investigator**

[3] Processing and Properties of Polymer-Grafted Nanoparticle Monolayers. FA9550-23-1-0288. Air Force Office of Scientific Research, United States, 2023–2026.
Role: **Postdoctoral Scholar and Collaborator**

[4] Modeling Polymers with End-on and Side-on Liquid Crystal Moieties: Effects of Sequence on Phase Behavior and Thermomechanical Response. New Directions (PRF 62346-ND7). American Chemical Society Petroleum Research Fund; United States, 2022–2023.
Role: **Postdoctoral Scholar**

[5] Biomimetic design of soft condensed materials: A molecular modeling approach. FONDECYT Iniciación Nº 3240676 11170056. ANID; Chile, 2018–2021.
Role: **Technical staff**

Academic and University Service

Reviewer for Journal Articles

Scientific Reports
Applied Physics Letters
Computational Materials Science
Soft Matter
Physics of Fluids
The Journal of Chemical Physics
The Journal of Physical Chemistry B

Judge for "12th Annual Graduate Research Symposium (GRS)", The Ohio State University 2023

Chairman, session on "Structure and Dynamics of Ion-Containing Polymers II" 2022
APS March Meeting, Chicago, United States

Event Organization and Outreach

Congreso Regional 2025 Explora Biobío. 2025
Role: Evaluated student research projects in science and innovation, providing critical feedback on methodology, scientific rigor, and clarity of presentation in an online academic setting.

Congreso Regional 2025 Explora Biobío. 2025
Role: Served as a member of the review committee for school-level research and innovation projects, assessing scientific quality and supporting the promotion of STEM education at the regional level.

Symposium: MODELACIÓN AVANZADA DE FLUIDOS, Universidad Técnica Federico Santa María (2025). 2025
Role: Invited Speaker. Presented research on linear and nonlinear rheology of entangled polymer melts using the discrete slip-link model, highlighting predictive capabilities and connections to molecular-level dynamics in complex fluids.

Scientific talk at Colegio Santa Leonor, Talcahuano, Universidad de Concepción. 2024
Role: Presenter in the lecture series organized by the Department of Sciences of the school, "La capacidad de asombro ante el carácter omnipresente de los fenómenos científicos que coexisten en nuestro medio." The talk, titled "Ciencia dura y Materia blanda: Entendiendo el Lenguaje de los Materiales," was inspired by the book published by Nobel Laureate Pierre-Gilles de Gennes, based on his outreach lectures after receiving the prize. It explored everyday phenomena associated with these materials in a didactic way and included experimental demonstrations with polymeric and non-Newtonian fluids.

Seminar Series of Soft Matter, The Ohio State University. 2023
Role: Organization of an internal seminar series for graduate students, postdocs, and professors in Polymer and Soft Matter-focused groups. The Seminars involve scientists from 4 Departments: Chemical and Biomolecular Engineering, Chemistry and Biochemistry, Mechanical Engineering and Food Science and Technology, as well as external invitees.

Breakfast of Science Champion, The Ohio State University. 2023
Role: Organization an update of outreach activities of Hall Research Group, in particular, an interactive simulation setup for pure polymers that has been successful in engaging both K-12 students and the general public in understanding the molecular basis of material properties. for better use with K-12 participants.