

Juan Rodrigo Vélez Cordero

CONTACT

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RESEARCH

Microhydrodynamics, complex fluids and optofluidics: confined Brownian motion, interaction of light with microparticles, applied microfluidics, biophysics (swimming and propulsion in non-Newtonian fluids at low Reynolds numbers), multiphase flows in complex liquids.

EDUCATION

Ph.D. in Material Science and Technology

- *Universidad Nacional Autónoma de México UNAM*, 2011. Thesis: *Study of the properties of bubble flows in non-Newtonian fluids.*

M.D. in Biochemical Science

- *Universidad Nacional Autónoma de México*, 2007. Thesis: *Applicability of the dynamic pressure method for the $k_L a$ determination in Newtonian fluids in an agitated vessel.*

B.D. in Biochemical Engineering

- *Instituto Politécnico Nacional, Escuela Nacional de Ciencias Biológicas*, 2003. Thesis: *Quality, safety and development of new products in the food industry.*

POSTDOCTORAL ACTIVITY AND RESEARCH STAYS

PDF in the Department of Mechanical and Aerospace Engineering, University of California at San Diego, advisor: Dr. Eric Lauga

- *Theoretical and Numerical Study of Cells Propelled by Flagella in Complex Fluids*, 2011-2012. UC-MEXUS Fellowship.

PDF in the Material Research Institute, UNAM, advisor: Dr. Juan Hernández Cordero

- *Interaction of laser beams with micro- and nanostructures*, 2013-2014. CONACyT project CB-2010/154464.

Research stay in the Department of Chemical and Biological Engineering, University of British Columbia, Canada, host advisor: Professor James J. Feng.

- *Numerical study (ALE code for finite element methods) of the interaction of bubbles rising in non-Newtonian fluids*, 2009.

TEACHING

Universidad Autónoma de San Luis Potosí UASLP, México

- *Algebra and trigonometry course, B.D. in Biophysics*, 2015 (5 hours/week)

Material Research Institute, UNAM.

- *Preparatory course "Mathematical Foundations for material science" in the material science postgraduate program*, 2014 (4 hours/week).

Material Research Institute, UNAM.

- Seminar course “Microfluidics and its applications in micro-channel flows and optical tweezers” 2013 (2 hours/week).

PUBLICATIONS

- (1) **J. Rodrigo Vélez-Cordero**, J. Hernández-Cordero, Heat conduction in PDMS-carbon nanoparticle membranes irradiated with optical fibers, submitted to the International Journal of Thermal Science.
- (2) **J. Rodrigo Vélez-Cordero**, Misael Giovanni Pérez Zúñiga, J. Hernández-Cordero, An optopneumatic piston for microfluidics, *Lab Chip* **15** (2015) 1335.
- (3) A.M. Velázquez-Benítez, Moisés Reyes-Medrano, **J. Rodrigo Vélez-Cordero**, J. Hernández-Cordero, Controlled Deposition of Polymer Coatings on Cylindrical Photonic Devices, *IEEE/OSA Journal of Lightwave Technology*, DOI: 10.1109/JLT.2014.2377173.
- (4) **J. Rodrigo Vélez-Cordero**, Johanna Lantenet, Juan Hernández-Cordero, Roberto Zenit, Compact bubble clusters in Newtonian and non-Newtonian liquids, *Phys. Fluids* **26** (2014) 053101.
- (5) **J. Rodrigo Vélez-Cordero**, A.M. Velázquez-Benítez, J. Hernández-Cordero, Thermocapillary flow in glass tubes coated with photoresponsive layers, *Langmuir* **30** (2014) 5326.
- (6) Roger M. Arco, **J. Rodrigo Vélez-Cordero**, Eric Lauga, Roberto Zenit, Viscous pumping inspired by flexible propulsion, *Bioinspir. Biomim.* **9** (2014) 036007.
- (7) **J. Rodrigo Vélez-Cordero**, Eric Lauga, Waving transport and propulsion in a generalized Newtonian fluid, *J. Non-Newtonian Fluid Mech.* **199** (2013) 37.
- (8) D. Legendre, R. Zenit, **J. Rodrigo Vélez-Cordero**, On the deformation of gas bubbles in liquids, *Phys. Fluids* **24** (2012) 043303.
- (9) **J. Rodrigo Vélez-Cordero**, D. Sámano, R. Zenit, Study of the properties of bubbly flows in Boger-type fluids, *J. Non-Newtonian Fluid Mech.* **175** (2012) 1.
- (10) **J. Rodrigo Vélez-Cordero**, D. Sámano, R. Zenit, Bubble Clusters in Associative Polymers. Part VII *Gallery of Fluids. Experimental and Theoretical Advances in Fluid Dynamics*, Jaime Klapp et al. (eds.), Springer-Verlag, Berlin 2012.
- (11) **J. Rodrigo Vélez-Cordero**, D. Sámano, P. Yue, J. Feng, R. Zenit, Hydrodynamic interaction between a pair of bubbles ascending in shear-thinning inelastic fluids. *J. Non-Newtonian Fluid Mech.* **166** (2011) 118.
- (12) **J. Rodrigo Vélez-Cordero**, R. Zenit, Bubble cluster formation in shear-thinning inelastic bubbly columns. *J. Non-Newtonian Fluid Mech.* **166** (2011) 32.

PROYECTS WITH THE INDUSTRY

- (1) **J. Rodrigo Vélez-Cordero**, F.E. Mancilla Ramos, R. Zenit, Hydrodynamic performance of chest drains. July 2011. The study was performed with post-operative chest drains produced by Aptic Inc.

ASSISTANCE TO CONFERENCES

- Oral presentation of the work “Thermocapillary flow induced by the optical irradiation of carbon nanoparticles” in the *66st Annual Meeting of the Division of Fluids Dynamics of the American Physical Society*, Pittsburgh 2013, **J. Rodrigo Vélez-Cordero**, Juan Hernández-Cordero.
- Oral presentation of the work “Propulsion in a generalized Newtonian fluid” in the *65st Annual Meeting of the Division of Fluids Dynamics of the American Physical Society*, San Diego, California 2012, **J. Rodrigo Vélez-Cordero**, Eric Lauga.
- Oral presentation of the work “Study of the behavior of rising bubbles in a Boger-type fluid” in the *64st Annual Meeting of the Division of Fluids Dynamics of the American Physical Society*, Baltimore, Maryland 2011, **J. Rodrigo Vélez-Cordero**, Diego Sámano, Roberto Zenit.
- Presentation of the poster “Hydrodynamic interaction between a pair of bubbles ascending in shear-thinning inelastic fluids” in the *XVIth International Workshop on Numerical Methods for Non-Newtonian flows*, Northampton Massachusetts 2010, **J. Rodrigo Vélez-Cordero**, D. Sámano, P. Yue, J.J. Feng, Roberto Zenit.
- Oral presentation of the work “A numerical study of the hydrodynamic interaction of bubble pairs ascending in non-Newtonian liquids” in the *15ª Congreso de la Sociedad Mexicana de Física, División de fluidos y plasmas*, Acapulco 2009 and in the *62st Annual Meeting of the Division of Fluids Dynamics of the American Physical Society*, Minneapolis, Minnesota, **J. Rodrigo Vélez-Cordero**, Diego Sámano, P. Yue, J. J. Feng, Roberto Zenit.
- Oral presentation of the work “Study of the properties of bubbly flows in non-Newtonian liquids” in the *14ª Congreso de la Sociedad Mexicana de Física, División de Fluidos y Plasmas*, Zacatecas 2008 and in the *61st Annual Meeting of the Division of Fluids Dynamics of the American Physical Society*, San Antonio, Texas, **J. Rodrigo Vélez-Cordero**, Roberto Zenit.
- Oral presentation of the work “Applicability of the dynamic pressure method for the $k_L a$ determination in Newtonian fluids in an agitated vessel” in the *5ª Congreso Nacional de Biotecnología del Instituto Politécnico Nacional*, México D.F. 2006, **J. Rodrigo Vélez-Cordero**, Alberto Tecante.
- Staff member in the *13ª Congreso Nacional de Ingeniería Bioquímica y el 9ª Congreso Nacional de Biotecnología y Bioingeniería*, Veracruz, México 2001.

STUDENTS

Co-advisor of Misael Giovanni Pérez Zúñiga

- *Thesis: Fabrication of an optopneumatic piston at microscales, UNAM 2014*

Co-advisor of Diego Sámano García

- *Thesis: Hydrodynamic between a bubble pair in non-Newtonian fluids, UNAM 2012*

SNI (Researchers National System): National Research Candidate