Daniel **Zambrano Juca**

CHEMICAL ENGINEER - PROCESS SIMULATION AND OPTIMIZATION

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Professional Profile

Chemical Engineer with a Doctorate and postdoctoral experience, specialized in the design, modeling and optimization of advanced fluidized bed reactors for catalytic and energy applications. Extensive background in applied research, complemented by a Master's in Environmental Engineering focused on environmental pollution management and wastewater treatment. Teaching experience at universities in Ecuador. Strong knowledge in programming (Python, C++, Java, MatLab) and mobile application development, which enriches my technical profile in engineering. Seeking to apply my skills to provide innovative solutions at the intersection of chemical, environmental engineering and emerging technologies.

Education

PhD in Chemical and Environmental Engineering
Zaragoza, Spain

UNIVERSITY OF ZARAGOZA
Feb. 2020

- Thesis: Dry reforming of biogas in advanced fluidized bed reactors: Process intensification for energy purposes
- Grade: Excellent "cum laude"

Master's in Mobile Application Development
Valencia, Spain

POLYTECHNIC UNIVERSITY OF VALENCIA
Sep. 2021

- Thesis: Development of a hybrid application for the PULSO brand
- Technologies: Angular, MongoDB, Ionic, NodeJS, XCode, Xamarin, Android, Firebase

Master's in Environmental Engineering
Valencia, Spain

POLYTECHNIC UNIVERSITY OF VALENCIA
Oct. 2013

- Thesis: Characterization of morphological properties of flocs in activated sludge using image analysis techniques
- Double specialization: Environmental Management and Urban Wastewater Treatment

Chemical Engineer
Cuenca, Ecuador

UNIVERSITY OF CUENCA
Dec. 2006

- Technologies: Polymers, Ceramics, Meat Products, Cement, Sugar
- Professional Internship: La Libertad Refinery

Work Experience

Postdoctoral Researcher
Zaragoza, Spain

UNIVERSITY OF ZARAGOZA
Sep. 2022 – Sep. 2024

- Research in modeling and simulation of catalytic processes using cyclic process technologies.
- Design and optimization of advanced reactors for energy and environmental applications.
- One-year research stay at the Department of Chemical Engineering, University of Manchester as Visiting Researcher

Temporary Faculty
Ambato, Ecuador

TECHNICAL UNIVERSITY OF AMBATO (UTA)
Oct. 2021 – Feb. 2022

- Academic Department: Faculty of Food Science and Engineering and Biotechnology
- Courses: Research Methodology, Material and Energy Balance.
- Fulfillment of non-teaching duties associated with the position.

Temporary Faculty
Santo Domingo, Ecuador

ARMED FORCES UNIVERSITY (ESPE)
May. 2021 – Sep. 2021

- Academic Department: Department of Life Sciences and Agriculture.
- Courses: Transport Phenomena, Unit Operations, Environmental Biotechnology, Biosafety, Technology Transfer and Agricultural Extension.
- Fulfillment of non-teaching duties.

Research Scholar - PhD Candidate
Zaragoza, Spain

UNIVERSITY OF ZARAGOZA
Oct. 2015 – Apr. 2018

- Research in synthesis gas and high-purity H_2 production (dry reforming of biogas) in advanced fluidized bed reactors.
- Experimental determination of reaction kinetics, deactivation and catalytic regeneration.
- Mathematical modeling and simulation of processes and reactors.
- Experience in: experimental plants (fixed/fluidized bed); product analysis (GC/LC, MS); solid characterization (XRD, SEM, TEM, TGA).
- Development and numerical resolution of kinetic and mathematical reactor models (Runge Kutta, Method of Lines, Finite Differences).
- Data analysis, model fitting and programming (MatLab, Hysys, Python, C++).

Temporary Faculty *Cuenca, Ecuador*

University of Cuenca *Mar. 2014 – Aug. 2015*

- Academic Department: Faculty of Chemical Sciences.
- Courses: Physics I, Linear Algebra, Heat Transfer, Chemical Kinetics, Research Methodology.
- Research: Environmental Studies Center - CEA.
- Non-teaching and administrative duties in social outreach and accreditation processes.

Chemical Laboratory Analyst *Cuenca, Ecuador*

Continental Tire Andina *Mar. 2008 – Sep. 2011*

- Analysis of raw materials and materials in manufacturing process.
- Analysis of physicochemical properties for radial truck tire production.
- Management and disposal of out-of-specification materials.

Scientific Production

Scientific Journal Articles

- **Daniel Zambrano Juca**, Jaime Soler, Javier Herguido, Miguel Menéndez. "Conventional and improved fluidized bed reactors for dry reforming of methane: mathematical models". *Chemical Engineering Journal*, Vol. 393, Art. 124775, Elsevier, 2020. https://doi.org/10.1016/j.cej.2020.124775
- Enrique Asensi, **Daniel Zambrano Juca**, Elena Alemany, Daniel Aguado. "Effect of the addition of precipitated ferric chloride on the morphology and settling characteristics of activated sludge flocs". *Separation and Purification Technology*, Vol. 227, Art. 115711, Elsevier, 2019. https://doi.org/10.1016/j.seppur.2019.115711
- **Daniel Zambrano Juca**, Jaime Soler, Javier Herguido, Miguel Menéndez. "Kinetic Study of Dry Reforming of Methane Over Ni-Ce/Al$_2$O$_3$ Catalyst with Deactivation". *Topics in Catalysis*, Vol. 62, Is. 5-6, pp. 456-466, Springer, 2019. https://doi.org/10.1007/s11244-019-01157-2

Conference Presentations

- "Precipitated ferric chloride to improve the activated sludge hindered settling velocity: Impact and Modelling". Authors: Enrique Asensi, Elena Alemany, **Daniel Zambrano Juca**, Paola Duque Sarango, Daniel Aguado. Presented at: *10th IWA Symposium on Modelling and Integrated Assessment*, Copenhagen, Denmark, 01-04 Sep. 2019. Organized by: International Water Association.
- "Kinetic study of dry reforming of methane". Authors: **Daniel Zambrano Juca**, Jaime Soler, Javier Herguido, Miguel Menéndez. Presented at: *XXVI Ibero-American Congress of Catalysis*, Coimbra, Portugal, 09-14 Sep. 2018. Organized by: Portuguese Chemical Society.
- "Kinetic study of reaction and deactivation for dry reforming of methane with Ni-Ce/Al$_2$O$_3$ catalyst". Authors: **Daniel Zambrano Juca**, Jaime Soler, Javier Herguido, Miguel Menéndez. Presented at: *4th International Symposium on the Catalysis for Clean Energy and Sustainable Chemistry (CCESC 2018)*, Bilbao, Spain, 09-11 Jul. 2018. Organized by: Sustainable Process Engineering (SUPREN) Group and the University of the Basque Country.
- "Kinetic Study of Dry Reforming of Methane over Ni-Ce/Al$_2$O$_3$ Catalyst". Authors: **Daniel Zambrano Juca**, Jaime Soler, Javier Herguido, Miguel Menéndez. Presented at: *Europacat - Catalysis a bridge to the future*, Florence, Italy, 27-31 Aug. 2017. Organized by: EUROPACAT.
- "Kinetic study of the dry reforming of methane reaction with a Ni-Ce/Al$_2$O$_3$ catalyst". Authors: **Daniel Zambrano Juca**, Jaime Soler, Javier Herguido, Miguel Menéndez. Presented at: *Secat - Catalysis for a more sustainable world*, Oviedo, Spain, 26-28 Jun. 2017. Organized by: Spanish Society of Catalysis (SECAT).

Skills

Modeling, Simulation and Data Analysis

- Kinetic Modeling of Chemical Processes, Mathematical Modeling of Fixed Bed and Fluidized Bed Reactors.
- Numerical Resolution of ODEs and PDEs using numerical methods (Runge Kutta, Method of Lines, Finite Differences, Finite Elements)
- Data Analysis and Trend Interpretation, Model Fitting to Experimental Data, Statistical Analysis, Optimization

Laboratory Techniques and Research

- Design, Assembly and Operation of Experimental Plants.
- Operation of Fixed Bed, Fluidized Bed and Membrane Reactors.
- Analysis of Reaction Products (GC, LC, MS) and Characterization of Catalytic Solids (XRD, SEM, TEM, TGA)

- Production of High Purity Hydrogen and Synthesis Gas

Programming Languages and Software

- Numerical resolution: Python, MatLab, C++
- Chemical process simulation: Aspen Hysys, Aspen Plus, Barracuda Virtual Reactor
- Results analysis and graph generation: Excel, OriginLab

Application Development

- Languages: JavaScript, TypeScript, Swift, C#, Java
- Frontend Technologies: CSS, HTML, Angular
- Backend Technologies: Node.JS (Express.JS, Nest.JS), Spring Boot
- Mobile Frameworks: Ionic, Flutter
- Databases: PostgreSQL, MongoDB, Firebase Realtime Database
- Cloud Services: Firebase

General Skills

- Critical thinking, complex problem solving, data analysis, informed decision making.
- Design and execution of research projects, application of scientific methods to real problems, analysis and synthesis of information.
- Experience in university teaching, curriculum development, mentoring and academic supervision.

Languages

- Spanish: Native
- English: Reading Comprehension (B2), Listening Comprehension (B1), Speaking (B1), Writing (B1)

Awards and Funding

Awards:

"Cum Laude" Distinction in Doctoral Thesis
IQMA Doctoral Program

University of Zaragoza
Feb. 2020

- Thesis: "Dry reforming of biogas in advanced fluidized bed reactors: Process intensification for energy purposes".
- Conducted at the University Institute for Engineering Research of Aragon (I3A).

Honors (Matrícula de Honor) in Master's Thesis
Master's in Environmental Engineering

Polytechnic University of Valencia
Oct. 2013

- Thesis: "Characterization of morphological properties of flocs in activated sludge using image analysis techniques".
- Conducted at the Technical School of Civil Engineering.

Funding:

Margarita Salas Grant for Requalification of the Spanish University System (2021-2023)
University of Zaragoza

Ministry of Universities and European Union "NextGenerationEU/PRTR"
Awarded: Sep. 2022

- Type: Postdoctoral.
- Conducted at the University Institute for Engineering Research of Aragon (I3A).

Grant for Ibero-Americans in Doctoral Studies
University of Zaragoza

Banco Santander, S.A.
Nov. 2015 – Oct. 2017

- Type: Predoctoral.
- Conducted at the University Institute for Engineering Research of Aragon (I3A).

SENESCYT Scholarship Call 2011 - Ecuador
Polytechnic University of Valencia

Ministry of Higher Education, Science, Technology and Innovation (SENESCYT)
Sep. 2011 – Sep. 2013

- Type: Master's degree.
- Conducted at the Technical School of Civil Engineering.

Continuing Education

Software Development and Applications

Mobile Application Development Training Courses

Valencia, Spain

POLYTECHNIC UNIVERSITY OF VALENCIA - CENTER FOR CONTINUING EDUCATION

- Software Architectures and Advanced User Interface Design (80h, Jul. 2021)
- Advanced Web Apps (60h, Jul. 2021)
- iOS (60h, Jun. 2021)
- UWP - XAMARIN (60h, May. 2021)
- FIREBASE: Working in the Cloud (80h, Apr. 2021)
- Android: Programming Fundamentals (100h, Jan. 2021)
- Introduction to iOS (30h, Jan. 2021)
- Introduction to Web Apps Development (30h, Jan. 2021)
- Introduction to UWP - XAMARIN (30h, Dec. 2020)

Simulation, Modeling and Computational Tools

Training Courses in Environmental and Chemical Process Simulation

Valencia, Spain

POLYTECHNIC UNIVERSITY OF VALENCIA - CENTER FOR CONTINUING EDUCATION

- Introduction to Neural Networks with Matlab and Scilab (20h, Jul. 2016)
- Introduction to Process Control with Simulink and Xcos (20h, Mar. 2016)
- Design of User-Defined Functions with Simulink and Xcos (20h, Jan. 2016)
- GUI Graphical Interfaces for Process Simulation with Matlab and Scilab (15h, Oct. 2015)
- Introduction to Environmental and Chemical Process Simulation with Excel (40h, Oct. 2015)
- Introduction to Environmental and Chemical Process Simulation with Matlab and Scilab (150h, Oct. 2014)
- Introduction to Environmental and Chemical Process Simulation with Simulink and Xcos (150h, Oct. 2014)

Academic, Research and Teaching Skills

Research Training Courses

Zaragoza, Spain

UNIVERSITY OF ZARAGOZA (GRADUATE SCHOOL)

- Information Skills for Doctoral Students (12h, May. 2016)
- Academic Writing Style (20h, Apr. 2016)
- Academic English (20h, Mar. 2016)

Academic Skills and Teaching Courses

Cuenca, Ecuador

UNIVERSITY OF CUENCA (CHEMICAL SCIENCES)

- Research Project Formulation (40h, Jun. 2015)
- Virtual Teaching-Learning Environments: Planning and Didactic Strategies with Interactive Digital Whiteboards (40h, Sep. 2014)
- Fundamentals and Applications of Solar-Hydrogen Energy System (40h, Jul. 2014)