

# MIGUEL VAZQUEZ PUFLEAU

## PERSONAL PROFILE

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PhD in Energy, Environmental and Chemical Engineering with experience in the fields of aerosol science and technology, synthesis of nanomaterials, reaction engineering of complex processes, such as fundamental studies of nucleation rates, silane pyrolysis for polysilicon refining and carbon elimination from silicon kerf, design, construction and operation of bench scale reactors for synthesis and processing of nanoparticles with controlled morphology, such as fluidized beds and flow reactors, with over 2 years of industrial experience including process up-scale, customer relations, technology integration for solving customer needs, implementation and after sales support.

## EDUCATION

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PhD	<b>Energy, Environmental and Chemical Engineering</b> , Washington University in St. Louis, USA	2012 – 2016
MS	<b>Energy, Environmental and Chemical Engineering</b> , Washington University in St. Louis, USA	2012 – 2015
BS	<b>Chemical Engineering</b> , University of Guadalajara, Mexico	2005 – 2010
	<b>Medical and Pharmaceutical Biotechnology</b> , IMC Krems, Austria	2008 – 2009

## RESEARCH EXPERIENCE

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**University of Vienna (Austria)** Since Aug 2017

- Currently working as Postdoctoral researcher

### **Washington University in St. Louis (USA)**

***Study of silicon nucleation in silane pyrolysis reactor*** 2014 – 2016

- Successfully designed, constructed and operated an experimental setup for silane pyrolysis including control and monitoring loops for pressure and flow using LabVIEW, dilution probes, piping, structure, furnace, pump, and safety measures. The setup delivered reliable, high quality experimental data which was used to study the nucleation phenomenon based on the relative rates for nucleation and condensation of silane, and also to observe the interaction of silicon nanoparticles with an FBR. The data of these studies was used to propose a novel nucleation mechanism for silane pyrolysis.

***Process optimization based on mechanistic study of reaction kinetics*** 2013 – 2016

- Found optimal operating conditions for carbon elimination in silicon kerf with minimum oxidation by determining the kinetics and mechanism of relevant reactions. This is a crucial step for kerf recycling, a process worth 4 billion USD/year.

## TEACHING EXPERIENCE

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***Teaching Assistant*** 2013 – 2015

- Served as a teaching assistant for three Chemical Engineering courses: Thermodynamics, Product and Process Design and Chemical Engineering Laboratory.

## INDUSTRIAL EXPERIENCE

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***Process Engineer***, Tiger Coatings (Austria) 2017

***Product Manager***, Mejoras Energéticas (Mexico) 2010 – 2012

## AWARDS

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- Awarded with the Ernst Mach grant 2008
- 2<sup>nd</sup> Place 1<sup>st</sup> Mathematical Skills Contest ITESO (Regional contest) 2002

## TECHNICAL SKILLS

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Lab tools SEM, TEM, GCMS, FTIR, SMPS, APS, TC, TGA, DSC, BET, XRD, Rheometer, Atomizers, DLS, etc  
Languages: **English:** Proficient, **German:** Advanced, **French:** Intermediate, **Spanish:** Native language

## PUBLICATIONS

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1. **Vazquez-Pufleau, M.**, Chadha, T. Yablonsky, G. and Biswas, P., Carbon elimination from silicon kerf: Thermogravimetric analysis and mechanistic considerations, *Sci. Rep.*, **2017**, 7:40535, DOI: 10.1038/srep40535
2. **Vazquez-Pufleau, M.**, Chadha, T. Yablonsky G. Erk, H. and Biswas, P., Elimination of Carbon Contamination from Silicon Kerf using a Furnace Aerosol Reactor (FuAR) Methodology; *Ind. Eng. Chem. Res.*, **2015**, 54 (22), pp 5914–5920, DOI: 10.1021/acs.iecr.5b0057
3. **Vazquez-Pufleau, M.**, Thimsen E., Yamane M., Biswas P., Kinetics of Nucleation and Condensation of Silicon Nanoparticles from Silane in Helium Atmosphere reveal unexpected nucleation mechanism (**2017**), *Chem. Eng. Sci.*, to be submitted.
4. **Vazquez-Pufleau, M**, Wang, Y., Thimsen, E., & Biswas, P. Measurement of Silicon Nanoparticle sub-nm Clusters from Silane Pyrolysis in a Helium Atmosphere provides insights on its role in nucleation (**2017**), *J. Phys. Chem.*, to be submitted.
5. **Vazquez-Pufleau, M**, Biswas, P. & Thimsen, E, Capture of Silicon Agglomerates by Beads in a Fluidized Bed Reactor for the Production of Polysilicon (**2017**) *AICHE Journal*, in preparation.
6. Diebolder P., **Vazquez-Pufleau, M.**, Raliya, R., Thimsen, E, Biswas, P., and Rogers B. Case study of silicon nanoparticle biodistribution in mice with tumor, paving the road towards nanoparticles for cancer treatment, (**2017**) *Journal of Cancer Research and Clinical Oncology*, in preparation.

## CONFERENCE TALKS (T) AND POSTERS (P)

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**European Union Photovoltaic Solar Energy Conference and Exhibition (EU PVSEC)** 2016

5. Capture of Silicon Agglomerates in a Model Fluidized Bed Reactor for Polysilicon Production: MIGUEL VAZQUEZ PUFLEAU, Pratim Biswas, Martin Yamane and Elijah Thimsen (T)

**American Institute of Chemical Engineers (AIChE) Annual Meeting** 2015

4. Kinetics of Carbon Elimination in Silicon Kerf Using Thermo-Gravimetric Analysis Estimations: MIGUEL VAZQUEZ PUFLEAU Tandeep S. Chadha, Gregory S. Yablonsky and Pratim Biswas (P)
3. Rates of Silicon Nucleation and Condensation during Silane Pyrolysis: MIGUEL VAZQUEZ PUFLEAU, Martin Yamane, Shalinee Kavadiya, Elijah Thimsen and Pratim Biswas (P)

**American Association for Aerosol Research (AAAR) Annual Conference** 2015

2. Selective Oxidation of Carbon on Silicon Kerf using Furnace Aerosol Reactor (FuAR) aided by TGA Kinetic Estimations. MIGUEL VAZQUEZ PUFLEAU, Tandeep Chadha, Gregory Yablonsky, Henry Erk, Pratim Biswas (T)
1. Silicon Particle Formation and Growth in Silane Pyrolysis Reactors. MIGUEL VAZQUEZ PUFLEAU, Martin Yamane, Shalinee Kavadiya, Thimsen Elijah, Pratim Biswas (P)