Michael Julian Orella   Curriculum Vitae

CONTACT
INFORMATION

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MIT
77 Massachusetts Avenue
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Cambridge, MA 02139 USA

EDUCATION &
CREDENTIALS

Massachusetts Institute of Technology (Dual Ph.D./MSCEP Program)

Ph.D., Chemical Engineering,   Expected Graduation: 2019
- Thesis Title: *Towards electrocatalytic upgrading of lignocellulosic biomass*
- Advisors: Professor Fikile R. Brushett, Professor Yuriy Román-Leshkov
- Current GPA: 4.8/5.0

MSCEP, David H. Koch School of Chemical Engineering Practice,   June 2016
- Station 1: Emirates Global Aluminium
- Station 2: United States Food and Drug Administration
- GPA: 4.8/5.0

University of Delaware

B.ChE., Chemical Engineering,   May 2014
- GPA: 3.976/4.000
- Minor: Computer Science
- Honors Degree with Distinction
- Thesis Title: *Understanding Humins: Molecular Characterization and Growth Rates*
- Advisor: Professor Dionisios G. Vlachos
- Magna Cum Laude
- Alpha Lambda Delta President
- Engineers Without Borders Project Manager

ENGINEERING
EXPERIENCE

Doctoral Candidate   January 2015 to Present
Brushett and Román Groups, Massachusetts Institute of Technology

Selective Electrochemical Hydrogenation of Reductive Catalytic Fractionation Products
- Perform kinetic studies of electrochemical hydrogenation rates on different electrode surfaces
- Optimize catalyst chemistry and structure for achieving high conversions and selectivities
- Synthesize catalyst nanoparticles for inclusion into electrode material

Techno-Economic Analysis of Electrolytic Cells for Biomass Upgrading
- Predict the selling price of commodity aromatic chemicals from electrolytic processing
- Understand design criteria for new electrolytic cells in organic processing
- Directly compare the economic costs of high temperature processing vs. electrolytic processing

Graduate Consultant   October 2015 to March 2016
Food and Drug Administration

Custom gSOLIDS Module Permitting Residence Time Distributions
- Developed mathematical package in gPROMS language that allowed solid processing with unit operations represented by RTDs
- Developed C++ plugins for gPROMS language that allowed RTD manipulations
- Developed MATLAB GUI for users to import and fit experimental residence time distributions
- Extensions allowed users to simply model complicated solids processes in gSOLIDS software

Engineering Study of Perfusion Culture of CHO Cells - Project Lead
- Directly compared perfusion, fed-batch, and batch cultures of CHO Cells
- Constructed model for cell growth and production and estimated parameters from data
- Provided preliminary designs for control systems to allow automated operation

Emirates Global Aluminium

Operational Optimizations in Heat Recovery Steam Generation Units

- Developed detailed process simulation of EGA Jebel Ali power plant in AspenPlus software
- Proposed methods for optimizing plant operations for waste heat recovery
- Evaluated feasibility of various operational and capital-intensive changes

Understanding Aluminum Billet Discoloration - Project Lead

- Developed method to remove cosmetic discoloration from aluminum billets
- Analyzed discolored billets' microstructure using SEM-EDS and AFM
- Proposed possible changes that could be causing discoloration in the billets

Undergraduate Research Assistant   June 2011 to May 2014
Catalysis Center for Energy Innovation, University of Delaware

Understanding Humins: Molecular Characterization and Growth Rates

- Investigated structural changes that occur during humin formation via FTIR, NMR, and SEM
- Measured particle growth kinetics using dynamic light scattering
- Investigated effects of temperature and pH changes on humin growth rates

Optimization of Biphasic Reaction Conditions for Sugar Processing

- Studied partition coefficients of sugar derived chemicals in aqueous/organic systems
- Investigated the effects of additional components on equilibrium behavior (i.e. salting out)

Project Manager   March 2011 to May 2014
Engineers Without Borders University of Delaware Student Chapter

Cameroon Potable Water Project

- Led team of students in finalizing designs for water project servicing community of 3000
- Prepared reports and presentations for review by national EWB organization review
- Finalized implementation of system with team of 3 other students
- Prepared operating and troubleshooting manual for full system to pass on to community

Intern   May 2012 to August 2012
Air Products and Chemicals, Inc.

Design of Gas Client Database for Data Analytics

- Worked with marketing team to develop database of clients using a variety of products
- Developed scripts to quickly analyze and query database to allow for marketing optimization

TEACHING &
MENTORING
EXPERIENCE

Research Advisor and Mentor   September 2015 to Present
Massachusetts Institute of Technology

- Train and supervise undergraduate students in laboratory research activities

Project Manager   March 2011 to May 2014
Engineers Without Borders University of Delaware Student Chapter

- Mentored new project manager for upcoming projects
- Assisted students throughout the chapter in technical writing and designs

COMMUNITY
LEADERSHIP

President   January 2012 - December 2012
Alpha Lambda Delta Honors Society, University of Delaware

RESEARCH
AWARDS

National Science Foundation Graduate Research Fellowship   2014

ACADEMIC
AWARDS

T. W. Fraser Russell Undergraduate Enrichment Award   May 2013
University of Delaware General Honors Award   November 2012
University of Delaware Chemical Engineering Industrial Sponsors Scholarship   May 2011

LANGUAGES	English	Native Proficiency
	Spanish	Limited Working Proficiency

SKILLS &
COURSES

Engineering & Chemistry
Kinetics, Thermodynamics, Transport Phenomena, Catalysis, Electrochemistry, Uncertainty Analysis, Organic Chemistry, Inorganic Chemistry

Computational
Numerical Methods, AI, Parallel Computing, Data Structures, Software Engineering

Modeling & Numerical
Python, MATLAB, Java, VBA, C++, gPROMS, Mathematica, Maple

Other Computer
Linux, Unix, LaTeX, HTML, Origin

Systems
Electrolyzers, HPLC, GC, Packed-bed Reactors, Batch Reactors

Materials Characterization
XRD, SEM, TEM, STEM, EDS, FTIR, UV/vis, Raman, NMR

Other Laboratory
HPLC, GC, DLS, KF titration, Safety

PROFESSIONAL
MEMBERSHIPS

- American Chemical Society
- American Institute of Chemical Engineers

ACADEMIC
MEMBERSHIPS

- The Order of the Engineer
- Alpha Lambda Delta
- Tau Beta Pi

JOURNAL
ARTICLES

[1] George Tsilomelekis, **Orella, Michael J.**, Zhexi Lin, Ziwei Cheng, Weiqing Zheng, Vladimiros Nikolakis, and Dionisios G. Vlachos. Molecular structure, morphology and growth mechanisms and rates of 5-hydroxymethyl furfural (HMF) derived humins. *Green Chem.*, pages 1983–1993, 2016.

POSTERS

[2] **Orella, Michael J.**, George Tsilomelekis, Vladimiros Nikolakis, and Dionisios G. Vlachos. Spectroscopic characterization of hexose derived humins. In *AIChE Student Conference at the National Meeting*, 2013.

[3] **Orella, Michael J.**, George Tsilomelekis, Vladimiros Nikolakis, and Dionisios G. Vlachos. Understanding humins: Growth rates, structural features and catalytic implications. In *Catalysis Center for Energy Innovation Symposium*, 2014.