

GEORGIOS (GEORGE) TSILOMELEKIS

Department of Chemical & Biochemical Engineering

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APPOINTMENTS



Visiting Professor

(Fall 2023)

Institute of Nanoscience and Nanotechnology, NCSR "Demokritos", Greece



Visiting Professor

(Fall 2022)

Dept. of Chemical and Biomolecular Engineering, University of Pennsylvania, USA



Associate Professor

(July 2021 - Today)

Dept. of Chemical and Biochemical Engineering, Rutgers University – New Brunswick, NJ



Assistant Professor

(Sept. 2015- 2021)

Dept. of Chemical and Biochemical Engineering, Rutgers University – New Brunswick, NJ

EDUCATION



Postdoctoral Researcher *(Advisor: Professor Dion Vlachos)*

(2012 - 2015)

Catalysis Center for Energy Innovation (CCEI), University of Delaware, USA Department of Chemical and Biomolecular Engineering

Research Project: Solvent Effects on Biomass Conversion Applications



Ph.D. in Chemical Engineering *(Advisor: Professor Soghomon Boghosian)*

(2006 - 2011)

Department of Chemical Engineering, University of Patras, Greece, 2011

Thesis title: Structure-activity relationships for supported metal oxide catalytic systems



M. Sc. in Energy and Environment

Department of Chemical Engineering, University of Patras, Greece, 2011



Five years Diploma in Chemical Engineering

(2001 - 2006)

Department of Chemical Engineering, University of Patras, Greece, 2006

CERTIFICATES/LICENCES



Mini-MBA/Engineers and Technology Managers,

Rutgers University, 2022

Mini-MBA/Brand Development & Marketing Communications,

Rutgers University, 2023

INDUSTRIAL EXPERIENCE

Internship at Hellenic Aerospace Industry, Greece, Summer of 2004

RESEARCH INTERESTS

CATALYSIS AND REACTION ENGINEERING

- H₂ Production via Catalysis | Alternative and Renewable Fuels | CO₂ Mitigation
- Natural Gas Utilization | Oxidative Dehydrogenation Pathways | Olefin Production
- Biomass to Fuels and Chemicals | Solvent Effects on Biomass Processing | Waste Valorization
- CO₂ Valorization in Tandem with Alkane Conversion
- Process Analytical Technologies in Pharmaceutical Manufacturing
- Continuous Manufacturing of Active Pharmaceutical Ingredients
- Catalytic Approaches and Spectral Derived Kinetics in Pharmaceutical Synthesis

SYNTHESIS OF CATALYSTS

- Synthesis of Nanomaterials | Colloidal Routes for Mixed Metal Oxides
- Controlled Synthesis of Isolated Dispersed Metal Oxides Sites
- Effect of Preparation Methods on the Structure and Activity of Nanomaterials/Catalysts
- Supported and Mixed Metal Oxide Catalysts | Zeolites
- Catalyst Manufacturing (Drying, Calcination, Impregnation)

ADVANCED SPECTROSCOPIC CHARACTERIZATION

- In Situ/Operando Spectroscopy (Raman, IR, UV-Vis, NMR)
- Structure-Activity Relationships in Complex Reactions
- 2D Correlation Spectroscopy | Reaction Induced Difference Spectroscopy
- Transient Operando Spectrokinetics
- PCA and PLS Techniques for Robust Calibration Models

ACADEMIC SCHOLARSHIPS AND AWARDS

- [Emerging Investigator, Reaction Chemistry and Engineering, 2019](#)
- Excellence in Teaching and Advising Award, Department of Chemical and Biochemical Engineering, Rutgers University, 2018
- Outstanding Faculty Award, Department of Chemical and Biochemical Engineering, Rutgers University, 2018
- [Early Career Award, National Science Foundation, 2018](#)
- [Doctoral New Investigator Award, American Chemical Society, Petroleum Research Fund, 2017](#)
- 1st place award | Catalysis Society of Metro, NY (best poster presentation), 2015
- 1st place award | Gordon Research Conference on Catalysis, NH, (best poster presentation), 2014
- Award and Scholarship of Excellence (*Yiannis Kevrekidis Scholarship*), Department of Chemical Engineering, University of Patras, Greece, 2002

h – index: 21, over 1850 citations (based on Google Scholar “Tsilomelekis”)

1. Y. Wu, S. Sourav, A. Worrada, J. Zhou, S. Caratzoulas, G. Tsilomelekis, W. Zheng and D. G. Vlachos, “Dynamic Formation of Brønsted Acid Sites over Supported WO_x/Pt on SiO₂ Inverse Catalysts—Spectroscopy, Probe Chemistry, and Calculations”, *ACS Catalysis*, **2023**, 13, 11, 7371
2. A. Zuber, George Tsilomelekis*, “Acidity-activity relationships in the solvent-free tert-butylation of phenol over sulfated metal oxides”, *Applied Catalysis A: General*, **2023**, 652, 119040
3. J. A. Konkol and George Tsilomelekis*, “Porchlight: An Accessible and Interactive Aid in Preprocessing of Spectral Data”, *Journal of Chemical Education*, **2023**, 100, 3, 1326
4. H. Wang, T. D. Nguyen and G. Tsilomelekis*, “Propane Oxidative Dehydrogenation Using CO₂ Over CrO_x/Fe–CeO₂ catalysts”, *Catalysis Science and Technology*, **2023**, 13, 2360-2369
5. C. Wang, T. Xie, PA Kots, BC Vance, K. Yu, P. Kumar, J. Fu, S. Liu, G. Tsilomelekis, EA Stach, W. Zheng, DG Vlachos, “Polyethylene Hydrogenolysis at Mild Conditions over Ruthenium on Tungstated Zirconia” *JACS Au*, **2021**, 1 (9), 1422-1434
6. M. Kazancioglu, G. Tsilomelekis, R. Lehman, M. Hara, “FTIR Studies on Plasticization of Silicate Glass with Ionic Liquids (Conversion to Silicate Polymers)”, *Journal of Non-Crystalline Solids*, **2021**, 561, 120757
7. V. Chopda, A. Gyorgypal, Ou Yang, R. Singh*, R. Ramachandran, H. Zhang, G. Tsilomelekis, SPS Chundawat*, M. G Ierapetritou, “Recent Advances in Integrated Process Analytical Techniques, Modeling, and Control Strategies to Enable Continuous Biomanufacturing of Monoclonal Antibodies”, *Journal of Chemical Technology & Biotechnology*, **2021**, 97, 9, 2317
8. T. Nguyen, F. E. Celik* and G. Tsilomelekis*, “CO₂ Assisted Ethane Oxidative Dehydrogenation Over MoO_x catalysts supported on Reducible CeO₂-TiO₂”, *Catalysis Science & Technology*, **2020**, 11, 5791
9. J. Marlowe and G. Tsilomelekis*, “Accessible and Interactive Learning of Spectroscopic Parameterization Through Computer Aided Training”, *Journal of Chemical Education*, **2020**, 97, 4527
10. Z. Li†; A. Zuber†; Z. Wang; J. Marlowe; A. Vekaria; Y. Lu; H. Zhang*; **G. Tsilomelekis***, Towards the Coupling of Microbial Biosynthesis and Catalysis for the Production of Alkylated Phenolic Compounds. *AIChE Journal* 66 (12), e16547
11. J. Marlowe; S. Acharya; A. Zuber; **G. Tsilomelekis***, Characterization of Sulfated SnO₂-ZrO₂ Catalysts and Their Catalytic Performance on the Tert-Butylation of Phenol. *Catalysts*, **2020**, 10, 726.
12. H. Wang; **G. Tsilomelekis***, Catalytic performance and stability of Fe-doped CeO₂ in propane oxidative dehydrogenation using carbon dioxide as an oxidant. *Catalysis Science & Technology* **2020**, 10, 4362.
13. J. Colon-Ortiz; P. Ramesh; **G. Tsilomelekis**; A. V. Neimark*, Permeation dynamics of dimethyl methylphosphonate through polyelectrolyte composite membranes by in-situ Raman spectroscopy. *Journal of Membrane Science* **2020**, 595.
14. T. Q. Tran; W. Q. Zheng; **G. Tsilomelekis***, Molten Salt Hydrates in the Synthesis of TiO₂ Flakes. *Acs Omega* **2019**, 4 (25), 21302-21310.
15. T. V. Tsoulos; S. Atta; M.J. Lagos; M. Beetz; P.E. Batson; **G. Tsilomelekis**; L. Fabris*, Colloidal plasmonic nanostar antennas with wide range resonance tunability. *Nanoscale* **2019**, 11 (40), 18662-18671.

16. K. X. Lee; H. Wang; S. Karakalos; **G. Tsilomelekis***; J. A. Valla*, Adsorptive Desulfurization of 4,6-Dimethyldibenzothiophene on Bimetallic Mesoporous Y Zeolites: Effects of Cu and Ce Composition and Configuration. *Ind Eng Chem Res* **2019**, *58* (2), 18301-18312.
17. P. Ramesh; A. Kritikos; **G. Tsilomelekis***, Effect of metal chlorides on glucose mutarotation and possible implications on humin formation. *Reaction Chemistry & Engineering* **2019**, *4* (2), 273-277.
18. K. X. Lee; **G. Tsilomelekis**; J.A. Valla*, Removal of benzothiophene and dibenzothiophene from hydrocarbon fuels using CuCe mesoporous Y zeolites in the presence of aromatics. *Appl Catal B-Environ* **2018**, *234*, 130-142.
19. A. G. Kalampounias*; **G. Tsilomelekis**; S. Boghosian, Molten and glassy tellurium(IV) oxosulfato complexes in the TeO₂-K₂S₂O₇ system studied by Raman spectroscopy: Stoichiometry, vibrational properties and molecular structure. *Vib Spectrosc* **2018**, *97*, 85-90.
20. A. M. Pennington; A. I. Okonmah; D. T. Munoz; **G. Tsilomelekis**; F. E. Celik*, Changes in Polymorph Composition in P25-TiO₂ during Pretreatment Analyzed by Differential Diffuse Reflectance Spectral Analysis. *J Phys Chem C* **2018**, *122* (9), 5093-5104.
21. Z. W. Cheng; J. L. Everhart; **G. Tsilomelekis**; V. Nikolakis; B. Saha; G. G. Vlachos*, Structural analysis of humins formed in the Bronsted acid catalyzed dehydration of fructose. *Green Chem* **2018**, *20* (5), 997-1006.
22. A. Tribalis; **G. Tsilomelekis**; S. Boghosian*, Molecular structure and reactivity of titania-supported transition metal oxide catalysts synthesized by equilibrium deposition filtration for the oxidative dehydrogenation of ethane. *Cr Chim* **2016**, *19* (10), 1226-1236.
23. **G. Tsilomelekis**; G. D. Panagiotou; P. Stathi; A. G. Kalampounias; K. Bourikas; C. Kordulis; Y. Deligiannakis; S. Boghosian*; A. Lycourghiotis*, Molybdena deposited on titania by equilibrium deposition filtration: structural evolution of oxo-molybdenum(VI) sites with temperature. *Physical Chemistry Chemical Physics* **2016**, *18* (34), 23980-23989.
24. **G. Tsilomelekis**; M. J. Orella; Z. X. Lin; Z. W. Cheng; W. Q. Zheng; V. Nikolakis; D. G. Vlachos*, Molecular structure, morphology and growth mechanisms and rates of 5-hydroxymethyl furfural (HMF) derived humins. *Green Chem* **2016**, *18* (7), 1983-1993.
25. W. H. Deng; J. R. Kennedy; **G. Tsilomelekis**; W. Q. Zheng; V. Nikolakis*, Cellulose Hydrolysis in Acidified LiBr Molten Salt Hydrate Media. *Ind Eng Chem Res* **2015**, *54* (19), 5226-5236.
26. L. Yang; **G. Tsilomelekis**; S. Caratzoulas; D. G. Vlachos*, Mechanism of Bronsted Acid-Catalyzed Glucose Dehydration. *ChemSuschem* **2015**, *8* (8), 1334-1341.
27. A. G. Kalampounias*; **G. Tsilomelekis**; S. Boghosian*, Glass-forming ability of TeO₂ and temperature induced changes on the structure of the glassy, supercooled, and molten states. *J Chem Phys* **2015**, *142* (15).
28. A. G. Kalampounias*; **G. Tsilomelekis**; S. Boghosian, Vibrational dephasing and frequency shifts of hydrogen-bonded pyridine-water complexes. *Spectrochim Acta A* **2015**, *135*, 31-38.
29. T. R. Josephson; **G. Tsilomelekis**; C. Bagia; V. Nikolakis; D. G. Vlachos; S. Caratzoulas*, Solvent-Induced Frequency Shifts of 5-Hydroxymethylfurfural Deduced via Infrared Spectroscopy and ab Initio Calculations. *Journal of Physical Chemistry A* **2014**, *118* (51), 12149-12160.
30. A. G. Kalampounias*; **G. Tsilomelekis**; S. Boghosian, Unraveling the role of microenvironment and hydrodynamic forces on the vibrational relaxation rates of pyridine-water complexes. *J Mol Liq* **2014**, *198*, 299-306.
31. A. Tribalis; G. D. Panagiotou; **G. Tsilomelekis**; A. G. Kalampounias; K. Bourikas; C. Kordulis; S. Boghosian*; A. Lycourghiotis*, Temperature-Dependent Evolution of the Molecular Configuration of Oxo-Tungsten(VI) Species Deposited on the Surface of Titania. *J Phys Chem C* **2014**, *118* (21), 11319-11332.

32. **G. Tsilomelekis**; T. R. Josephson; V. Nikolakis; S. Caratzoulas*, Origin of 5-Hydroxymethylfurfural Stability in Water/Dimethyl Sulfoxide Mixtures. *Chemsuschem* **2014**, 7 (1), 117-126.
33. A. G. Kalampounias*; **G. Tsilomelekis**; S. Boghosian, Liquid phase dynamics of molten $M_2S_2O_7$ (M = K, Cs): A temperature dependent Raman spectroscopic study. *Vib Spectrosc* **2013**, 65, 66-73.
34. **G. Tsilomelekis**; S. Boghosian*, On the configuration, molecular structure and vibrational properties of MoOx sites on alumina, zirconia, titania and silica. *Catal Sci Technol* **2013**, 3 (8), 1869-1888.
35. A. G. Kalampounias; **G. Tsilomelekis**; R. W. Berg; S. Boghosian*, Molybdenum(VI) Oxosulfato Complexes in MoO_3 - $K_2S_2O_7$ - K_2SO_4 Molten Mixtures: Stoichiometry, Vibrational Properties, and Molecular Structures. *Journal of Physical Chemistry A* **2012**, 116 (35), 8861-8872.
36. A. G. Kalampounias*; **G. Tsilomelekis**; S. Boghosian, Short-time microscopic dynamics of aqueous methanol solutions. *Mol Phys* **2012**, 110 (24), 3095-3102.
37. **G. Tsilomelekis**; S. Boghosian*, An operando Raman study of molecular structure and reactivity of molybdenum(VI) oxide supported on anatase for the oxidative dehydrogenation of ethane. *Physical Chemistry Chemical Physics* **2012**, 14 (7), 2216-2228.
38. **G. Tsilomelekis**; S. Boghosian*, In Situ Raman and FTIR Spectroscopy of Molybdenum(VI) Oxide Supported on Titania Combined with O^{18}/O^{16} Exchange: Molecular Structure, Vibrational Properties, and Vibrational Isotope Effects. *J Phys Chem C* **2011**, 115 (5), 2146-2154.
39. **G. Tsilomelekis**; S. Boghosian*, Structural and vibrational properties of molybdena catalysts supported on alumina and zirconia studied by in situ Raman and FTIR spectroscopies combined with O^{18}/O^{16} isotopic substitution. *Catal Today* **2010**, 158 (1-2), 146-155.
40. **G. Tsilomelekis**; A. Tribalis; A. G. Kalampounias; S. Boghosian; G. D. Panagiotou; K. Bourikas; C. Kordulis; A. Lycourghiotis*, Temperature - dependent evolution of molecular configurations of oxomolybdenum species on MoO_3/TiO_2 catalysts monitored by in situ Raman spectroscopy. *Stud Surf Sci Catal* **2010**, 175, 613-616.
41. S. A. Karakoulia; K. S. Triantafyllidis; **G. Tsilomelekis**; S. Boghosian; A. A. Lemonidou*, Propane oxidative dehydrogenation over vanadia catalysts supported on mesoporous silicas with varying pore structure and size. *Catal Today* **2009**, 141 (3-4), 245-253.
42. J. Due-Hansen; S. Boghosian; A. Kustov; P. Fristrup; **G. Tsilomelekis**; K. Stahl; C. H. Christensen; R. Fehrmann*, Vanadia-based SCR catalysts supported on tungstated and sulfated zirconia: Influence of doping with potassium. *J Catal* **2007**, 251 (2), 459-473.
43. **G. Tsilomelekis**; A. Christodoulakis; S. Boghosian*, Support effects on structure and activity of molybdenum oxide catalysts for the oxidative dehydrogenation of ethane. *Catal Today* **2007**, 127 (1-4), 139-147.

PATENTS

- G. Tsilomelekis, J. Colon-Ortiz, A. V. Neimark, "Methods for detection of the permeation of chemical warfare agents through membranes", RU/TECH-ID 2019-163, To be filed as US patent

GRANTS/CONTRACTS AWARDED

2017• **National Science Foundation**

Title: “Elucidating Solvent Effects in Biomass Conversion Reactions by means of Operando Spectroscopy”

PI: **G. Tsilomelekis**

Amount: \$292,193

2018• **National Science Foundation (*Early CAREER Award*)**

Title: “CAREER: Revolutionizing propylene production via Oxidative Dehydrogenation and CO₂ dissociation in tandem”

PI: **G. Tsilomelekis**

Amount: \$500,000

• **American Chemical Society, Petroleum Research Fund (*Doctoral New Investigator Award*)**

Title: “Developing novel mixed metal oxides as stable solid super acids for alkylation reactions”

PI: **G. Tsilomelekis**

Amount: \$110,000

• **RAPID – Department of Energy**

Title: “Microwave scale-out technologies”

PI: D. G. Vlachos

Co-PIs: B. Saha, R. Lobo, **G. Tsilomelekis**, M. Ierapetritou, G. Stefanidis

Amount: Rutgers’ subaward \$600,000 (Tsilomelekis and Ierapetritou)

2019• **Food & Drug Administration (FDA)**

Title: “Advanced continuous upstream manufacturing of biotherapeutics”

PI: M. Ierapetritou

Co-PIs: R. Ramachandran, R. Singh, H. Zhang, S. Chundawat, **G. Tsilomelekis**

Amount: \$1,800,000

• **New York Power Authority**

Title: “Real – time analysis of transformer oil for timely failure detection”

PI: Optimal Solutions, Inc. (*Vijay Hanagandi*)

Co-PIs: **G. Tsilomelekis**

Amount: Rutgers’ subaward \$49,500

2021• **Food & Drug Administration (FDA)**

Title: “Integrated toolbox for digital design, scale-up, control, and optimization of advanced API manufacturing processes”

PI: F. Muzzio (Rutgers)

Co-PIs: R. Singh (Rutgers), **G. Tsilomelekis** (Rutgers), Z. Nagy (Purdue), N. Collins (SRI)

Amount: \$4,198,914

2022

- **Food & Drug Administration (FDA)**

Title: “A Model-Based Systems Engineering Approach to End-to-End Pharmaceutical Manufacturing of Liquid”

Lead Institution: NIPTE

PIs and Co-PIs: J. Ferri (VCU), F. Gupton, F. Muzzio (Rutgers), R. Singh (Rutgers), **G. Tsilomelekis** (Rutgers)

Amount: \$4,999,953

INVITED PRESENTATIONS AND SEMINARS

1. G. Tsilomelekis, “Unraveling the Selective Activation of Light Alkanes in Light of CO₂ Utilization A Spectrokinetic Perspective” 2023, National Technical University of Athens, Greece
2. G. Tsilomelekis, “In Situ and Operando Spectroscopy-A Perspective for Advancing Catalyst Manufacturing” 2023, Catalysis Manufacturing Consortium Conference, Rutgers
3. G. Tsilomelekis, “Raman Spectroscopy-Applications in the Field of Catalysis” 2022, ACS CATL Summer School
4. G. Tsilomelekis, “Oxidative Dehydrogenation of Alkanes The non trivial role of CO₂ as a mild oxidant” 2021, International Symposium on Advanced Materials and Catalysis for Energy and Environmental Applications
5. G. Tsilomelekis, “Competitive Pathways in Alkane Oxidative Dehydrogenation over Metal Oxides: A Spectrokinetic Approach” 2021, ACS National meeting, Atlanta, GA (*in honor of Prof. Dion Vlachos for receiving the Award for Exceptional Achievements in Catalysis from the ACS CATL Division*)
6. G. Tsilomelekis, “Coupling Metabolic Engineering, Adsorption and Catalysis for the Production of Alkylated Phenolics from Renewable Sources” 2020, #ChemistsLive, ACS Cross-Division Virtual, Live Content Event
7. G. Tsilomelekis, “Coupling ODH with CO₂ splitting to boost olefin production: A spectroscopic perspective” Chania, Greece, November 2020, Keynote, *Rescheduled due to COVID-19*
8. G. Tsilomelekis, “Oxidative Dehydrogenation of Alkanes: The non-trivial role of CO₂ as a mild oxidant” Lehigh University, *October 2020*,
9. G. Tsilomelekis, “Oxidative Dehydrogenation of Alkanes: The non-trivial role of CO₂ as a mild oxidant”, Auburn University, March 2020, *Rescheduled due to COVID-19*
10. G. Tsilomelekis, “Tackling Dissolved Gas Analysis in Mineral Oils via Spectroscopy” NYSERDA, 2019
11. G. Tsilomelekis, “Heterogeneous Catalysis, Material Synthesis and Operando Spectroscopy”, Industrial Advisory Board, Rutgers, 2019
12. G. Tsilomelekis, *SCUT summer workshop: “Revolutionizing Reaction Engineering and Catalysis through In-situ and Operando Spectroscopy”* Rutgers, The State University of New Jersey, Piscataway, NJ, USA, 2018
13. G. Tsilomelekis, “Insights into the Molecular Structure of Sulfated Mixed Metal Oxide Catalysts Via Vibrational Spectroscopy”, Minneapolis, MN, USA, 2017, *Invited talk In Honor of the 2016 Wilhelm Award Winner*
14. G. Tsilomelekis, *SCUT summer workshop: “Revolutionizing Reaction Engineering and Catalysis through In-situ and Operando Spectroscopy”* Rutgers, The State University of New Jersey, Piscataway, NJ, USA, 2017

15. G. Tsilomelekis, "Heterogeneous Catalysis, Material Synthesis and Operando Spectroscopy", ExxonMobil Research and Engineering Company, Annandale, NJ, USA, 2017
16. G. Tsilomelekis, "Solvent Effects on the Stability of 5-Hydroxymethylfurfural: Understanding the Undesirable Side Reactions", Rutgers, The State University of New Jersey, Piscataway, NJ, USA, Annual Symposium NYCS, 2017
17. G. Tsilomelekis, "Renewable and Alternative Sources for the Production of Fuels and Chemicals", New Jersey Institute of Technology, University Heights Newark, NJ, USA, 2016
18. G. Tsilomelekis, "Renewable and Alternative Sources for the Production of Fuels and Chemicals", Tufts University, Medford, MA, USA, 2015
19. G. Tsilomelekis, "Renewable and Alternative Sources for the Production of Fuels and Chemicals", Rutgers, The State University of New Jersey, Piscataway, NJ, USA, 2015
20. G. Tsilomelekis, "Solvent Effects on the Stability of 5-Hydroxymethylfurfural: Understanding the Undesirable Side Reactions", University of Delaware, Newark, DE, USA, 2015

CONTRIBUTED PRESENTATIONS AT NATIONAL AND INTERNATIONAL CONFERENCES

(Including refereed conference proceedings appearing on Web of Science)

1. "At-Line Monitoring of Diphenhydramine Synthesis Via Low-Field NMR Spectroscopy As Process Analytical Technology" 2023, AIChE annual meeting, Orlando, FL
2. "Spectroscopic Characterization of Inverse Catalysts" 2023, AIChE annual meeting, Orlando, FL
3. "Optimizing Reverse Phase Chromatography Separation in Molnupiravir Synthesis: An Inverse Method Approach" 2023, AIChE annual meeting, Orlando, FL
4. "CFD-Based Evaluation of Mixing Efficiency and Flow Uniformity in an Smx Static Mixer" 2023, AIChE annual meeting, Orlando, FL
5. "At-Line Monitoring of Diphenhydramine Synthesis Via Low-Field NMR Spectroscopy As Process Analytical Technology" 2022, 28th North American Catalysis Society Meeting, Providence, RI
6. "Coupling Operando Raman Methodology with Isotopic Experiments to Address the Redox Cycle of Molecularly Controlled MoO_x Sites" 2022, 28th North American Catalysis Society Meeting, Providence, RI
7. "An At-Line Monitoring Strategy of Sugar Isomerization via ATR-FTIR Spectroscopy for Rapid Catalyst Development" 2022, 28th North American Catalysis Society Meeting, Providence, RI
8. "Spectroscopic Characterization of Inverse Catalysts" 2022, 28th North American Catalysis Society Meeting, Providence, RI
9. "Simultaneous Vibrational Spectroscopic Monitoring of Glucose Transformation" 2022, AIChE annual meeting, Phoenix, AZ
10. "Elucidating the Acidity-Activity Relation in Sulfated Metal Oxides for the Solvent-Free Tert-Butylation of Phenol" 2022, AIChE annual meeting, Phoenix, AZ
11. "Open Source Python-Based Application As an Interactive Spectroscopic Teaching Aid" 2022, AIChE annual meeting, Phoenix, AZ
12. "CO₂ Assisted Ethane Oxidative Dehydrogenation over MoO_x Catalysts Supported on Reducible CeO₂-TiO₂" 2021, 27th North American Catalysis Society Meeting, New York, NY
13. "Acidity-Activity Relationships in the Tert-Butylation of Phenol over Sulfated Metal Oxides" 2021, 27th North American Catalysis Society Meeting, New York, NY

14. "A Predictive Partial Least Square Model for Inline Monitoring of Biomass Reactions Via ATR-FTIR Spectroscopy" 2021, 27th North American Catalysis Society Meeting, New York, NY
15. "Active Centers of Inverse Catalysts" 2021, 27th North American Catalysis Society Meeting, New York, NY
16. "Investigating the Redox Behavior of MoO_x Catalysts Supported on CeO₂-TiO₂ via In-Situ Raman and FTIR Spectrokinetics" 2021, PACIFICHEM, (Remote)
17. "Development of in Situ Monitoring of Biomass Reactions Via Spectroscopic Techniques" 2021, AIChE annual meeting, Boston, MA
18. "Investigating the Redox Behavior of MoO_x Catalysts Supported on CeO₂-TiO₂ Via in-Situ Raman and FTIR Spectrokinetics" 2021, AIChE annual meeting, Boston, MA
19. "Matlab Based Applications As Accessible and Interactive Educational Modules to Advance Spectroscopic Understanding" 2021, AIChE annual meeting, Boston, MA
20. "CO₂ Assisted Oxidative Dehydrogenation of Ethane over Supported Metal Oxide Catalysts" 2020, AIChE annual meeting (Virtual)
21. "Towards the Potential Coupling of Microbial Biosynthesis and Heterogeneous Catalysis for the Petroleum-Free Production of Alkylated Phenol Compounds" 2020, AIChE annual meeting (Virtual)
22. "Catalytic Evaluation of Sulfated Metal Oxide Catalysts for the Solvent-Free Tert-Butylation of Phenol" 2020, AIChE annual meeting (Virtual)
23. "A combined CFD and Experimental Study on the Adsorption of Biomass Derived Molecules in Packed Bed Microreactors" 2020, AIChE annual meeting (Virtual)
24. "Stable Cr-based Catalyst for Propane Oxidative Dehydrogenation with CO₂ as Mild Oxidant" 2020, ICC, San Diego, CA (*Canceled due to COVID 19*)
25. "Coupling Experimental Kinetics and Thermodynamic Modeling with IR Spectroscopy and Machine Learning for Fundamental Studies and Fast Product Quantification" 2019, AIChE annual meeting, Orlando, FL
26. "Combining Experimental Kinetics and Thermodynamic Modeling with IR Spectroscopy and Machine Learning for Fundamental Studies and Fast Product Quantification" 2019, AIChE annual meeting, Orlando, FL
27. "Adsorption of Biomass-Derived Value-Added Chemicals in a Micro-Packed-Bed Reactor" 2019, AIChE annual meeting, Orlando, FL
28. " Molten Salt Hydrates As Solvent Media in the Synthesis of Mesoporous TiO₂ Flakes" 2019, AIChE annual meeting, Orlando, FL
29. "Study the Hydration Behavior of Surface Metal Oxide Species Via in-Situ Vibrational Spectroscopy" 2019, AIChE annual meeting, Orlando, FL
30. "Investigation of the Sulfur Adsorption Capability of Ion-Exchange Y Zeolites Using Density Functional Theory and IR Spectroscopy" 2019, AIChE annual meeting, Orlando, FL
31. "Elucidating the Roles of Support and Environment on Sulfated Metal Oxides" 2019, AIChE annual meeting, Orlando, FL
32. "Mesoporous TiO₂ Catalysts with Tunable Thickness and Pore Size" 26th North American Catalysis Society Meeting, 2019, Chicago, IL, USA
33. "Effect of Metal Chlorides on Glucose Mutarotation and Implications on Humic Molecular Structure" 26th North American Catalysis Society Meeting, 2019, Chicago, IL, USA
34. "Effect of Metal Chlorides on Hexoses Interconversion and Humic Formation Reactions" 26th North American Catalysis Society Meeting, 2019, Chicago, IL, USA
35. "Molten Salt Hydrates in the Synthesis of Metal Oxide Catalysts" 4th North American Symposium on Chemical Reaction Engineering, Houston, TX, 2019

36. "Structure/Redox/Reactivity Properties of Dispersed Vanadium Species on TiO₂ for the Oxidative Dehydrogenation of Propane with CO₂" 2018, AIChE annual meeting, Pittsburgh, PA, USA
37. "A Spectroscopic Study on the Glucose and Fructose Mutarotation Reactions in the Presence of Lewis and Brønsted Homogeneous Acids" 2018, AIChE annual meeting, Pittsburgh, PA, USA
38. "Investigating the Effect of Cu and Ce Loading in Mesoporous Y Zeolite for the Adsorptive Desulfurization of 4,6-Dimethyldibenzothiohene" 2018, AIChE annual meeting, Pittsburgh, PA, USA
39. "Molten Salt Hydrates As Solvents in the Synthesis of Metal Oxide Catalysts" 2018, AIChE annual meeting, Pittsburgh, PA, USA
40. "Monitoring catalyst composition during synthesis and pretreatment with in situ spectroscopy" Abstr Pap Am Chem S 2018, 256.
41. "Structural Analysis of Humins Formed in the Brønsted-Catalyzed Dehydration of Fructose", 2017, AIChE annual meeting, Minneapolis, MN, USA
42. "Structural Analysis of Humins Formed in the Brønsted-Catalyzed Dehydration of Fructose", 2017, AIChE annual meeting, Minneapolis, MN, USA
43. "Experimental Studies of 4,6-Dimethyldibenzothiohene Adsorption on Metal-Exchanged Mesoporous Y Zeolites", 2017, AIChE annual meeting, Minneapolis, MN, USA
44. "Derivative Peak Fitting of Differential Diffuse Reflectance for Compositional Analysis of Multiphase Semiconductor, P25 TiO₂", 2017, AIChE annual meeting, Minneapolis, MN, USA
45. "Study of Glucose Anomers in the Presence of Metal Salts Using Raman and Reaction Induced Difference Infrared Spectroscopy", 25th North American Catalysis Society Meeting, 2017, Denver, CO, USA
46. "Study the Effect of Metal Salts on Glucose Isomerization by Means of Raman and Reaction Induced Difference Infrared Spectroscopy", 2016, AIChE annual meeting, San Francisco, CA, USA
47. "Unraveling the Interactions of Homogenous Lewis Acid Catalyst (aqueous Tin(IV) Chloride) Species with Glucose By Means of Raman Spectroscopy", 2016, AIChE annual meeting, San Francisco, CA, USA
48. "Cellulose hydrolysis in acidified molten salt hydrate reaction media: Insights from kinetic and spectroscopic studies" 252nd American Chemical Society National Meeting & Exposition, Philadelphia, PA, 2016
49. "Solvent Effects on the Stability of 5-Hydroxymethylfurfural: Understanding the Undesirable Side Reactions", 2016, 14th Panhellenic Symposium in Catalysis, Patras, Greece
50. "Understanding the Undesirable Side Reactions" 2015, AIChE annual meeting, Salt Lake City, UT, USA
51. "Solvent Effects on the Stability of 5-Hydroxymethylfurfural: Understanding the Undesirable Side Reactions" 2015, AIChE annual meeting, Salt Lake City, UT, USA
52. "Glass-forming ability of TeO₂ and temperature induced changes on the structure of the glassy, super cooled and molten state" 2015, 10th Panhellenic Symp. Chemical Engineering, Patras, Greece
53. "Elucidating the Role of Organic Co-Solvents in Fructose Dehydration Kinetics" 24th North American Catalysis Society Meeting, 2015, Pittsburgh, PA, USA
54. "Understanding the effect of polar aprotic co-solvents on 5-HMF production", 2015, New Jersey Institute of Technology, University Heights Newark, NJ, USA

55. "5-Hydroxymethyl Furfural Derived Humins: Growth Rates and Elucidation of Their Molecular Structure", 2014, AIChE annual meeting, Atlanta, GA, USA
56. "Unraveling Solvation Effects on 5-Hydroxymethylfurfural Degradation: Insights from Catalytic and Spectroscopic Studies", 2014, AIChE annual meeting, Atlanta, GA, USA
57. "Mechanistic Insights into Fructose Dehydration to 5-(hydroxymethyl)Furfural", 2014, AIChE annual meeting, Atlanta, GA, USA
58. "Efficient Cellulose Hydrolysis in Acidified Molten Salt Hydrate Reaction Media", 2014, AIChE annual meeting, Atlanta, GA, USA
59. "5-Hydroxymethyl Furfural Derived Humins: Growth Rates and Elucidation of Their Molecular Structure", 2014, AIChE annual meeting, Atlanta, GA, USA
60. "Mechanistic Insights into Fructose Dehydration to 5-(hydroxymethyl)Furfural", 2014, AIChE annual meeting, Atlanta, GA, USA
61. "Spectroscopic Insights into Cellulose Hydrolysis Utilizing Molten Salt Hydrates as Reaction Media. Understanding Structural Changes at the Molecular Level", 2014, AIChE annual meeting, Atlanta, GA, USA
62. "Enabling the Spectroscopic Tools That We Need to Get the Hidden Information We Want", 2014, AIChE annual meeting, Atlanta, GA, USA
63. "Ab Initio Study of Solvent-Induced Frequency Shifts of 5-Hydroxymethylfurfural" 2014, AIChE annual meeting, Atlanta, GA, USA
64. "Solvent-Induced Frequency Shifts of 5-Hydroxymethylfurfural and Their Role in Its Stability" 2014, AIChE annual meeting, Atlanta, GA, USA
65. "Origin of 5-Hydroxymethylfurfural stability in aqueous aprotic solvent mixtures", 2014, Catalysis Club of Philadelphia, Wilmington, DE, USA
66. "Cellulose hydrolysis under mild conditions in acidified molten salt hydrate media: Kinetics and insights from spectroscopic studies", 2014, New York Catalysis Society Annual Meeting, Lehigh, PA, USA
67. "Origin of 5-Hydroxymethylfurfural stability in aqueous aprotic solvent mixtures", 2014, New York Catalysis Society Annual Meeting, Lehigh, PA, USA
68. "Elucidating the solvation of 5-hydroxymethylfurfural (HMF) in DMSO/water mixed solvents and its effect in hydration and humin formation reactions" 2013, Catalysis Club of Philadelphia, Wilmington, DE, USA
69. "Understanding Solvent Effects in 5-hydroxymethylfurfural (HMF) Rehydration or Humin Formation Reactions", 23rd North American Catalysis Society Meeting, 2013, Louisville, KY, USA
70. "Spectroscopic Characterization of Acid Catalyzed Hexose Derived Humins", 2013, AIChE annual meeting, San Francisco, CA, USA
71. "Understanding Solvation Effects On Biomass Derived Platform Chemicals: A Combined Spectroscopic and Theoretical Approach" 2013, AIChE annual meeting, San Francisco, CA, USA
72. "Structure - Activity relationships of supported Molybdenum(VI) Oxide on TiO₂, Al₂O₃ and ZrO₂ by means of In Situ/Operando Raman and FTIR spectroscopies combined with 18O/16O exchange" 2012, Catalysis Club of Philadelphia, Wilmington, DE, USA
73. "On the configuration of MoO_x sites on alumina, zirconia and titania. Molecular structure, vibrational properties and vibrational isotope effects", 2011, International Conference on "Functional Materials: Catalysis, Electrochemistry and Surfactants", Fuengirola, Spain

74. "Temperature dependent evolution of molecular configurations of oxo-tungsten species on WO₃/TiO₂ catalysts by in situ Raman spectroscopy", 2011, 8th Panhellenic Symp. Chemical Engineering, Thessaloniki
75. "Raman study of complex formation during dissolution of MoO₃ in K₂S₂O₇-K₂S₂O₄ melts at high temperatures", 2011, 8th Panhellenic Symp. Chemical Engineering, Thessaloniki
76. "Molecular structure of MoO₃ catalysts supported on ZrO₂, Al₂O₃, TiO₂ and SiO₂ by in situ Raman and in situ IR spectroscopy and ¹⁸O isotopic substitution", 2010, 11th Panhellenic Catal. Symp., Athens, Greece
77. "Molecular structure and reactivity of MoO₃/TiO₂ catalysts for ethane oxidative dehydrogenation studied by operando Raman spectroscopy", 2009, 3rd COST Chemistry Workshop on "Structure-performance relationships at the surface of functional materials", Benahavis, Spain
78. "Structure and reactivity of MoO₃/TiO₂ catalysts for the oxidative dehydrogenation of ethane", 2009, 4th Panhellenic Symposium on Porous Materials, Patras, Greece
79. "Structure and reactivity of MoO₃/TiO₂ catalysts for the oxidative dehydrogenation of ethane by operando Raman spectroscopy", 2009, 7th Panhellenic Symp. Chemical Engineering, Patras, Greece
80. "Structure-performance relationships for MoO₃/TiO₂ catalysts for the ODH of ethane studied by Operando Raman spectroscopy", 2009, CLEAR Summer School in Catalysis, Sithonia, Greece
81. "Molecular structure and reactivity of MoO₃/TiO₂ catalysts for the oxidative dehydrogenation of ethane", 2009, OPERANDO III, Rostoc-Warnemunde, Germany
82. "Effect of structure of mesoporous silica substrates on the surface and catalytic properties of supported VO_x catalysts", 2008, Proc. 10th Panhellenic Catal. Symp., Metsovo, Greece p. 87
83. "Structure and reactivity of MoO₃/TiO₂ catalysts for the ODH of ethane", 2008, Proc. 10th Panhellenic Catal. Symp., Metsovo, Greece p. 87
84. "Oxidative dehydrogenation of propane over vanadia catalysts supported on non-porous, microporous and mesoporous silicate supports", 2007, EUROPACAT VIII, Helsinki, Finland
85. "On the active sites of supported V₂O₅ catalysts for the selective catalytic reduction of NO by NH₃. Structure - activity relationships", 2007, Proc. 6th Panhellenic Symp. Chemical Engineering, Athens, Greece, p. 1509
86. "Monolayer MoO₃ catalysts supported on ZrO₂, Al₂O₃, TiO₂ and SiO₂ for the ODH of ethane", 2007, Proc. 6th Panhellenic Symp. Chemical Engineering, Athens, Greece, p. 877
87. "Structure-activity relationships of supported MoO₃ catalysts for the ODH of ethane", 2006, Proc. 9th Panhellenic Catalysis Symposium, Lefkada, Greece, p. 204
88. "Effect of preparation procedure and composition of ZrO₂ support on structure and reactivity of V₂O₅ Catalysts for the selective catalytic reduction of NO by NH₃", 2006, Proc. 9th Panhellenic Catalysis Symposium, Lefkada, Greece, p. 78
89. "Molecular Structure and Catalytic Activity of Supported Molybdena Catalysts for the ODH of Ethane", 2006, OPERANDO II, Toledo, Spain

TEACHING EXPERIENCE AND INTERESTS

Rutgers University

- 155:341 Chemical Engineering Kinetics (Undergraduate Level)
- 155:298 Professional Skills Development Course (Undergraduate Level) | Co-teaching

- 155:501 Advanced Transport Phenomena I (Graduate Level)
- 155:514 Kinetics, Catalysis & Reactor Design (Graduate Level)

- South China University of Technology (SCUT) Student Summer Program at Rutgers
Summer 2017, 2018,
Topic: Revolutionizing Reaction Engineering and Catalysis Through in-situ and Operando Spectroscopy

University of Delaware

- Research mentor for three undergraduate students during postdoctoral training
- Research mentor for one undergraduate student under the REU program that promotes participation of students with disabilities in science

University of Patras, Greece

- Teaching Assistant (*in class recitations*)
 - *Basic Principles of Thermodynamics (two semesters)*
 - *Chemical Thermodynamics (two semesters)*
 - *Mass Transfer (one semester)*

DOCTORAL'S THESES SUPERVISED AS PRIMARY ADVISOR

Graduated

- **Dr. Hedun Hang**
Research Area: "[Metal oxide catalysts for the CO₂-assisted propane oxidative dehydrogenation](#)"
Date of PhD defense: December 2021

- **Dr. Adam Zuber**
Research Area: "[Heterogeneous catalysis for the liquid-phase alkylation of phenol with tert-butyl alcohol in solvent-free conditions](#)"
Date of defense: February 2023

- **Dr. Athanasios Kritikos**
Research Area: "[Mechanistic modeling and validation of multi-scale flow systems for process intensification](#)"
Date of defense: March 2023

- **Dr. Thu Nguyen**
Research Area: "[In-situ and operando molecular spectroscopy for the characterization of mixed metal oxide catalysts in redox reactions](#)"
Date of defense: March 2023

Current

- **Mr. Jakub Konnkol (Starting Date: 09/2019)**
Research Area: "Reaction engineering approaches in continuous synthesis and manufacturing of active pharmaceutical ingredients"
Date of defense: Expected in end-2024
- **Mr. Dhanush Thirulogachandar (Starting Date: 09/2023)**
Research Area: "In-situ and Operando investigation of alkane conversion reactions"
Date of defense: Expected in mid-2027
- **Mr. Hongnan Hu (Starting Date: 09/2023)**
Research Area: "Development of Acid Metal Oxides for Alkylation Reactions"
Date of defense: Expected in mid-2027

MASTER'S THESES SUPERVISED AS PRIMARY ADVISOR

Graduated

- **Dhanush Thirulogachandar**
Research Area: "Oxidative dehydrogenation of ethane using CO₂ over mixed metal oxides: Insights from isotopic labeling and operando spectroscopy"
Date of defense: March 2023
- **Chenfeng Huang**
Research Area: "[Optimization of the Conditions in the molten salt hydrated assisted synthesis method of TiO₂](#)"
Date of defense: April 2020
- **Pranav Ramesh**
Research Area: "[Homogeneous catalyst mediated glucose mutarotation studies using vibrational spectroscopy](#)"
Date of defense: October 2017
- **Shreyas Acharya**
Research Area: "[Characterization of surface sulfate species on mixed metal oxide catalysts](#)"
Date of defense: October 2017

UNDERGRADUATE STUDENTS SUPERVISED AS PRIMARY ADVISOR

- **Nikolai Styrkas** (2019-ongoing)
- **Justin Marlowe** (2016-2019)
- **Alex Barnes** (Fall 2019)
- **Philp Wong** (2016-2018)
Student Award: "2nd place award in Catalysis and Reaction Engineering poster session at the 2017 Annual AIChE Meeting"
- **Avi Shah** (2016-2018)
- **Catherine Estelle Nkoutche Matsingang** (Summer 2017)

- **Jess Khurana** (Summer 2017)
- **Michael Swierczynski** (Summer 2017 | RISE Program)
- **Ayman Saleh** (2016-2018)
Student Award: "1st place award in Catalysis and Reaction Engineering poster session at the 2016 Annual AIChE Meeting"
- **Melissa Piccirillo** (2015-2016)
- **Faculty advisor**
 - 2016-current: Rutgers Aresty Research Program
 - 2016-2019: Governor's School of New Jersey (Research for highschool students)
 - 2017: Rutgers' summer RISE program
 - 2015-2016: OXE Rutgers' Chapter (Chemical Engineering Honor Society)

SCIENTIFIC AND PROFESSIONAL SOCIETIES

- American Institute of Chemical Engineers (AIChE)
- Catalysis Club of Philadelphia
- Catalysis Society of Metro NY
- Technical Chamber of Greece
- Hellenic Catalysis Network

ACTIVITIES/SERVICE ON BEHALF OF PROFESSIONAL ACADEMIC ORGANIZATIONS

- **Catalysis Society of Metro NY**
 - Secretary (2016-2017)
 - Chair-Elect (2017-2018)
 - Chair (2018-2019)
- **Organizing / Chairing Activities**
 - 2018-2019: Organized series of talks for the monthly meetings of Catalysis Society of Metro NY
 - 2018: Organized annual [symposium](#) of the Catalysis Society of Metro NY, Lehigh, PA, US
 - 2015-ongoing: Chair/Co-chair at the AIChE Annual conference (20A Area)
 - 2015-ongoing: Chair/Co-chair at the North American Catalysis Society Meeting
 - 2018-ongoing: [Organizing Committee](#) for the 2021 North American Catalysis Society Meeting (Kokes Awards)
- **Ad hoc Reviewer for Grant Agencies**
 - National Science Foundation (CBET)
 - American Chemical Society-Petroleum Research Fund
 - Research Foundation Flanders (FWO) – European Agency
- **Ad hoc Reviewer for scientific journals**
 - ACS Catalysis
 - ACS Sustainable Chemistry and Engineering

- *Applied Catalysis A*
- *Applied Catalysis B*
- *Catalysis Today*
- *Nature Communications*
- *Industrial & Engineering Chemistry Research*
- *Chemical Engineering Journal*
- *Journal of Catalysis*
- *Reaction Chemistry and Engineering*
- *Topics in Catalysis*
- *Progress in Energy and Combustion Science*
- *Catalysts*

- **Leadership and Participation to major proposal activities**
 - *Led as a PI, a team of five (5) Rutgers' faculty members from interdisciplinary areas to apply for an Emerging Frontiers in Research and Innovation (EFRI) grant at NSF (\$2 Million).*
 - *Participant of the pre-proposal to DOE Bioenergy Research Centers for establishing Center of Integrated Microbial Resources for Sustainable Bioenergy at Rutgers University*
 - *Participant at the NRT: Rutgers CREST-C Program: Convergent Research in Engineering and Science Training in Catalysis From Laboratory Inception to Manufacturing at the Food/Energy/Water Nexus, led by Prof. M. S. Tomassone*
 - *Participant at the NRT-INFIEWS: Interdisciplinary Research Traineeship in Science and Engineering of Catalysis at the Nexus of Food, Energy and Water (SECnFEW), led by Prof. M. S. Tomassone*

- **Other activities**
 - *2020-current: Member of SOE Health and Safety Committee*
 - *2016-current: Participation at Rutgers Energy Institute*
 - *2019: Organized and developed and action plan for the "Materials – Energy – Modeling" group at CBE to increase efforts towards potential research collaboration across faculty members*
 - *2015-current: CBE graduate admissions*
 - *Participation at:*
 - *PhD recruiting events*
 - *Open house*
 - *Walk-in through the labs*
 - *Rutgers's day*
 - *Major's Night*