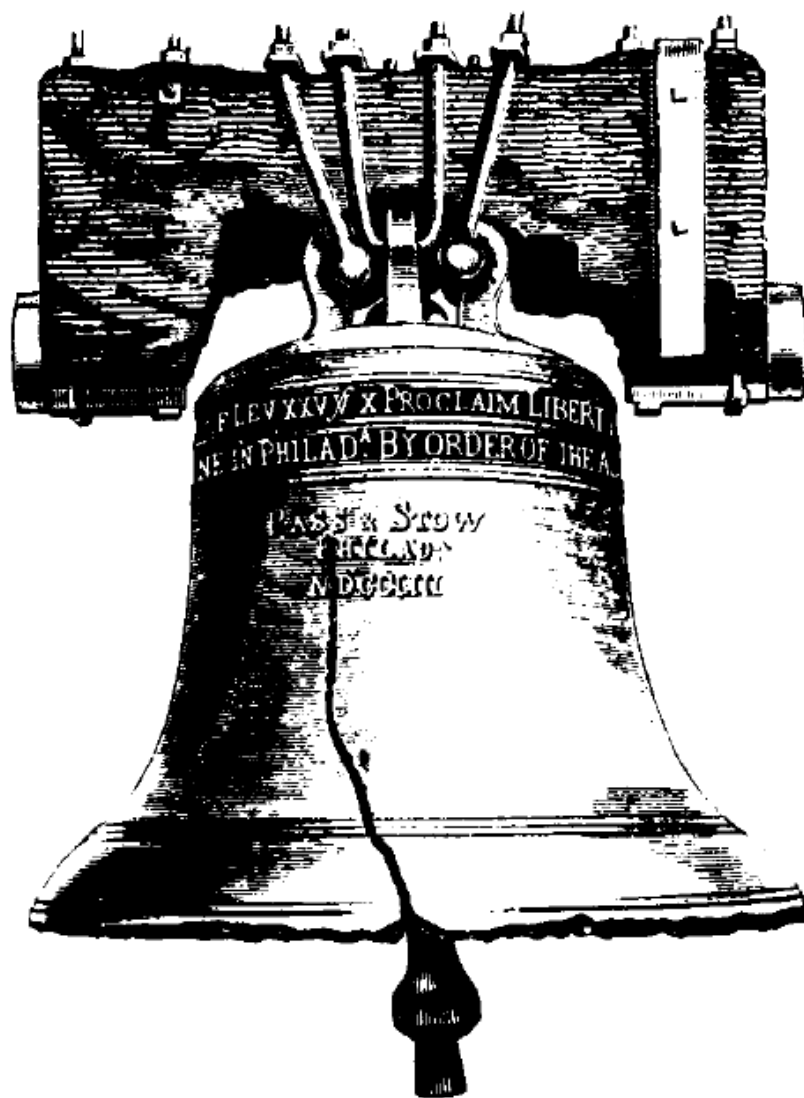


***Catalysis Club of Philadelphia***  
***2022 Spring Symposium Program***



***Promoting the science of catalysis since 1949***

**Thursday and Friday, May 05 and 06, 2022**

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## Spring Symposium 2022 Schedule of Events

### Thursday, May 05

- 8:50 AM **Opening Remarks.**
- 9:00 AM **Keynote, Prof. Raj Gounder, Purdue University.**  
“Consequences of Coupled Reaction-diffusion Phenomena for Alkene Oligomerization Catalysis by Bronsted Acid Zeolites”
- 9:45 AM **Dr. Michael Berg, University of Delaware.**  
“Catalytic Approaches and Tools to Valorize Polymer Plastics Waste”
- 10:20 AM **Ramchandra Gawas, Drexel University.**  
“Ionic Liquid Composite Electrocatalysts for the Oxygen Reduction Reaction”
- 10:45 AM **Break**
- 11:00 AM **Prof. Michele Sarazen, Princeton University.**  
“Reaction Diffusion, and Deactivation Rates of Aromatic Alkylation and Alcohol Etherification on Hierarchical Zeolites”
- 11:30 AM **Prof. Bin Liu, Kansas State University.**  
“1+1>2”. Evidence for Promoted Catalytic Performance on Binary Catalysts from Kinetic Modeling”
- 12:05 PM **Closing Remarks.**

### Friday, May 06

- 8:50 AM **Opening Remarks.**
- 9:00 AM **Dr. Partha Nandi, ExxonMobil.**  
“Direct Partial Oxidation of Methane to Methanol: New Learnings in an Old Challenge”
- 9:35 AM **Prof. Carsten Sievers, Georgia Tech.**  
“Fundamentals and Applications of Mechanocatalytic Process”
- 10:10 AM **Keynote, Prof. Susannah Scott, University of California, Santa Barbara.**  
“Catalytic Upcycling of Polyolefins to Value-added Molecules by Hydrogen Redistribution”
- 10:55 AM **Break.**
- 11:05 AM **Announcements**
- 11:10 AM **Dr. George Fortman, MBA. The Catalyst Group.**  
“Gold Sponsor Talk”
- 11:20 AM **Dr. Fabien Rioult, Zeolyst International / Ecovyst.**  
“Gold Sponsor Talk”
- 11:30 AM **Dr. David West, SABIC.**  
“Surprises and Disguises in Oxidative Coupling of Methane”
- 12:05 AM **Closing Remarks.**

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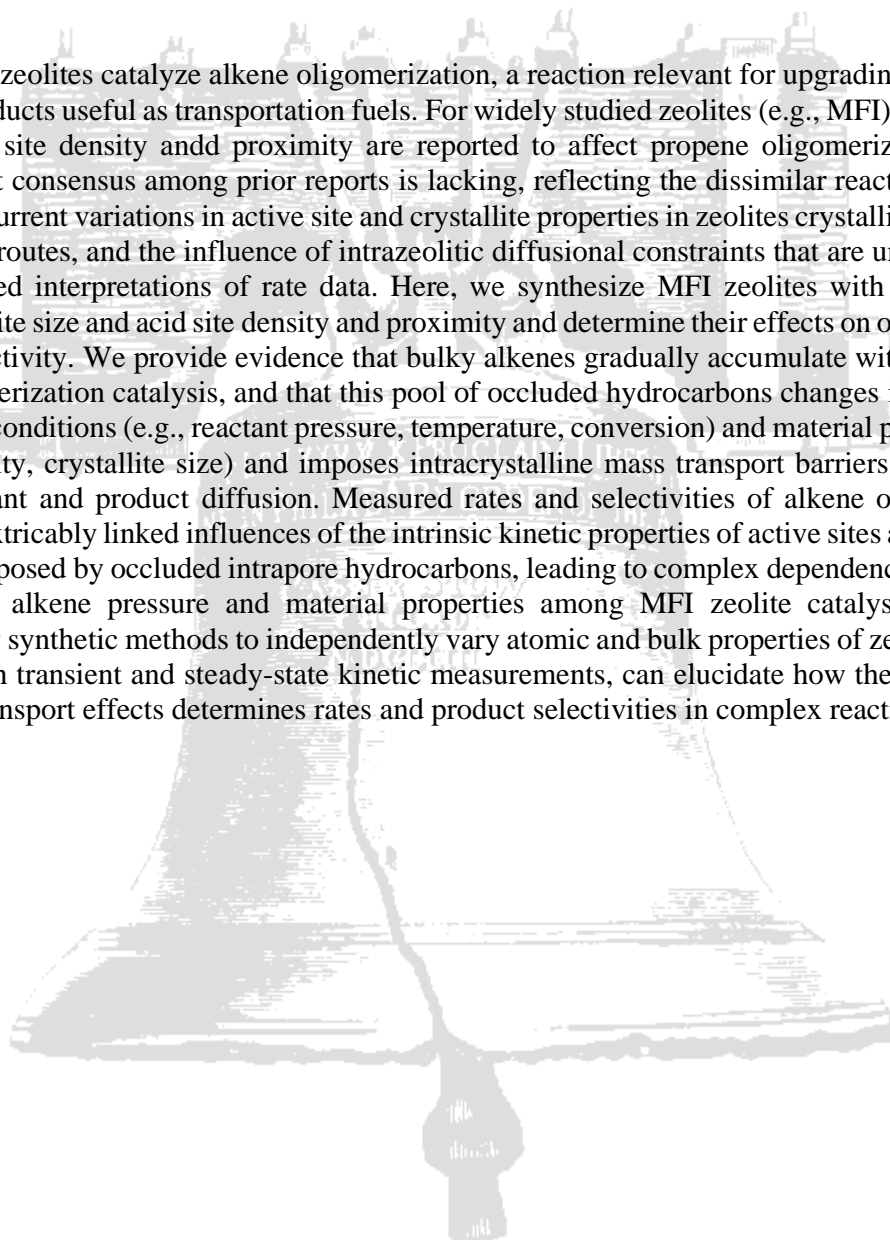
## Consequences of Coupled Reaction-Diffusion Phenomena for Alkene Oligomerization Catalysis by Brønsted Acid Zeolites

Elizabeth E. Bickel, Rajamani Gounder\*

Davidson School of Chemical Engineering, Purdue University, IN

### Abstract

Brønsted acid zeolites catalyze alkene oligomerization, a reaction relevant for upgrading light alkenes to heavier products useful as transportation fuels. For widely studied zeolites (e.g., MFI), the crystallite size and acid site density and proximity are reported to affect propene oligomerization rate and selectivity; yet consensus among prior reports is lacking, reflecting the dissimilar reaction conditions used, the concurrent variations in active site and crystallite properties in zeolites crystallized via typical hydrothermal routes, and the influence of intrazeolitic diffusional constraints that are unaccounted for in kinetic-based interpretations of rate data. Here, we synthesize MFI zeolites with independently varied crystallite size and acid site density and proximity and determine their effects on oligomerization rates and selectivity. We provide evidence that bulky alkenes gradually accumulate within MFI pores during oligomerization catalysis, and that this pool of occluded hydrocarbons changes in composition with reaction conditions (e.g., reactant pressure, temperature, conversion) and material properties (e.g., acid site density, crystallite size) and imposes intracrystalline mass transport barriers that influence rates of reactant and product diffusion. Measured rates and selectivities of alkene oligomerization reflect the inextricably linked influences of the intrinsic kinetic properties of active sites and diffusional constraints imposed by occluded intrapore hydrocarbons, leading to complex dependences of rates and selectivity on alkene pressure and material properties among MFI zeolite catalysts. This work illustrates how synthetic methods to independently vary atomic and bulk properties of zeolite catalysts, combined with transient and steady-state kinetic measurements, can elucidate how the confluence of kinetic and transport effects determines rates and product selectivities in complex reaction networks.



## Rajamani Gounder



### Biography

Raj Gounder is the Larry and Virginia Faith Professor of Chemical Engineering at Purdue University. He received his BS in Chemical Engineering with a double major in Chemistry from Wisconsin in 2006, his PhD in Chemical Engineering from UC-Berkeley in 2011 with Enrique Iglesia, and completed a postdoctoral stay at Caltech in 2013 with Mark Davis. His research group studies catalysis for applications in energy production and environmental protection, including automotive pollution abatement and converting carbon feedstocks to fuels and chemicals. His research focuses on elucidating the kinetic and mechanistic details of catalytic reactions, synthesizing zeolites with tailored site and surface properties, and developing methods to characterize and titrate active sites in catalytic materials. He has been recognized by the NSF and DOE Early Career Awards, the ACS CATL Early Career Award, the Sloan Research Fellowship in Chemistry, the AIChE 35 Under 35 Award, and the 3M Non-Tenured Faculty Award, in addition to recognition for outstanding teaching and mentoring. He serves as the President of the *Catalysis Club of Chicago*, an Associate Editor of *Science Advances*, and an Editorial Advisory Board member of *ACS Catalysis* and *Reaction Chemistry & Engineering*.

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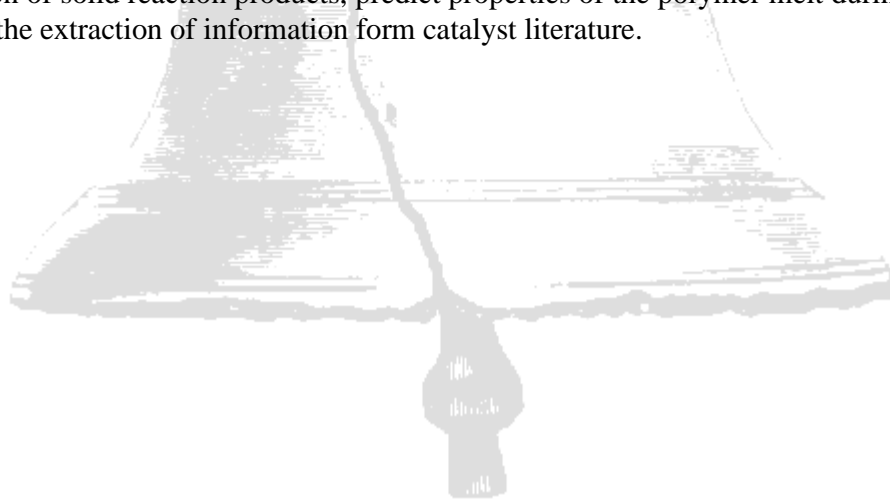
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## Catalytic Approaches and Tools to Valorize Polymer Plastics Waste

Dr. Michael Berg  
University of Delaware

### Abstract

Plastics play an indispensable role in many aspects of modern life, which has led to continuously increasing production. However, a very low percentage of polymer plastics waste (PPW) are recycled (less than 10% in the U.S.), causing deleterious environmental impacts such as landfill usage, aquatic pollution, and degradation byproducts. Current mainstream repurposing routes, such as mechanical processing and burning/incineration, are inefficient, require the incorporation of significant amounts of virgin material, and/or lead to lower-value products and emissions. This situation is further complicated by a shift in product demand from single-component to multi-component plastics, particularly in the packaging industry, in the form of composites, multilayers, and blends (with impurities, additives, etc.), which intensifies the need for innovative strategies to tackle PPW. The Center for Plastics Innovation (CPI) is developing atom- and energy-efficient catalytic processes for the chemical recycling, upcycling, and upgrading of plastics. CPI has developed a suite of hydrocracking and hydrogenolysis catalysts for the chemical deconstruction of polyethylene (PE), polypropylene (PP), and polystyrene (PS) into high-value products including fuels, lubricants, and starting materials for functional and/or readily recyclable polymers. Catalyst families were systematically studied for insight into the reaction to achieve lower reaction times, temperatures, and pressures. This effort led to the discovery of a novel adhesive isomerization mechanism for the PtWZr catalyst and novel hydrogen storage mechanism for the RuWZr catalyst. Furthermore, alkane metathesis chemistry was extended to PE deconstruction to enable the production of building blocks for further valorization. In parallel, both computational and experimental tools were created to further understand the polymer/catalyst interface, understand the effect of additives on the catalyst, enhance characterization of solid reaction products, predict properties of the polymer melt during the reaction, and automate the extraction of information from catalyst literature.



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## Michael Berg



## Biography

Dr. Michael Berg is the Science & Technology Director of the Center for Plastics Innovation at the University of Delaware, where he leads interdisciplinary research efforts on upcycling and recycling of polymer plastics waste. Prior to his current role, he led R&D projects at both WL Gore and WR Grace. He has also co-founded and acted as the Chief Technology Officer of 4 start-up companies that focused on creating novel polymers and processes for a variety of industries, and worked with startup companies to fund and develop their technologies as part of the strategic investment firm, In-Q-Tel. He received his PhD in Chemical Engineering from the Massachusetts Institute of Technology where he did his thesis work with Profs. Paula Hammond and Michael Rubner.



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## Ionic Liquid Composite Electrocatalysts for the Oxygen Reduction Reaction

Ramchandra Gawas, Maureen Tang, Joshua Snyder

Department of Chemical and Biological Engineering, Drexel University

### Abstract

Increasing the accessibility of green, affordable hydrogen and reducing the cost of polymer electrolyte membrane fuel cells (PEMFC) devices are critical to the widespread commercialization of hydrogen powered fuel cells. The high cost of PEMFCs is in part due to the high Pt loadings in the cathode catalyst layer (CCL) to compensate for kinetic and transport losses during the sluggish oxygen reduction reaction. Therefore, substantial research efforts have been focused on modifying the CCL and its constituent components to achieve cost parity with other advanced energy technologies, particularly in the transportation sector.

Hydrophobic ionic liquids (ILs) have been used as interfacial additives for oxygen reduction reaction (ORR) electrocatalysts, demonstrating enhanced catalyst activity and durability.<sup>1,2</sup> However, incorporating ILs or IL-modified catalysts into the electrodes of a PEMFC membrane electrode assembly (MEA) has proven to be challenging. To address this limitation, we developed a new ionomer chemistry with orthogonal properties of protonic conductivity and ionic liquid functionality: sulfonated poly(ionic liquid) block copolymers (S-PILBCPs). The new ionomer in the Pt/C CCLs yields a two-fold improvement in the kinetic activity, both in the half-cell and MEA. Furthermore, a Nafion/S-PILBCP composite ionomer substantially improves the high current density performance as well.<sup>3</sup>

In this work, we use rotating disk electrode (RDE) techniques to electrochemically characterize the Pt/S-PILBCP interface. Our analysis demonstrates the promise and utility of hydrocarbon-based poly(IL) ionomers over the traditional ionomer-Nafion and also provides important insights about observed MEA performance enhancements.

### References:

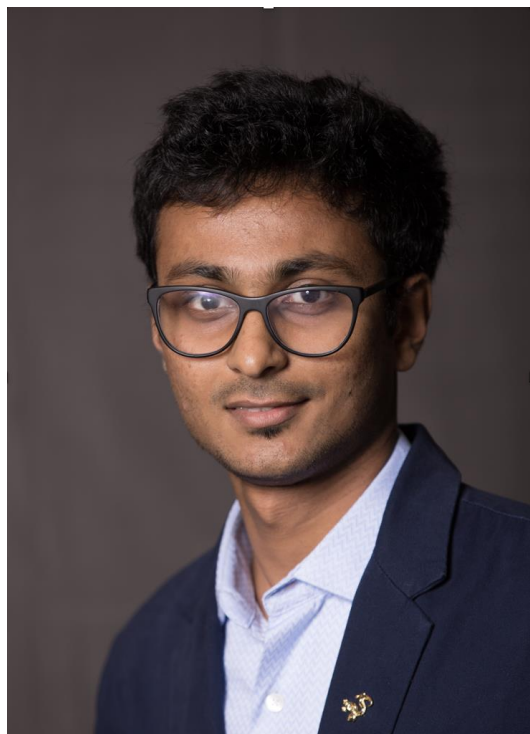
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2. Li, Y., Hart, J. L., Profitt, L., Intikhab, S., Chatterjee, S., Taheri, M. & Snyder, J. D. Sequential Capacitive Deposition of Ionic Liquids for Conformal Thin Film Coatings on Oxygen Reduction Reaction Electrocatalysts. *ACS Catal.* **9**, 9311–9316 (2019).
3. Li, Y., Cleve, T. Van, Sun, R., Gawas, R., Wang, G., Tang, M., Elabd, Y. A., Snyder, J. & Neyerlin, K. C. Modifying the Electrocatalyst–Ionomer Interface via Sulfonated Poly(ionic liquid) Block Copolymers to Enable High-Performance Polymer Electrolyte Fuel Cells. *ACS Energy Lett.* **5**, 1726–1731 (2020).

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## Ramchandra Gawas



### Biography

Ramchandra is a PhD Candidate in the Electrochemical Interfaces and Catalysis group at Drexel University. He is currently working on 'Ionic Liquid Composite Electrocatalysts for PEM fuel cells. Ram obtained his bachelor's and Master's degree in Chemical Engineering from the Indian Institute of Technology Gandhinagar, India. He has co-authored five peer-reviewed journal articles and a patent. Ram received George Hill, Jr. Endowed Fellowship (2018-20) and Carleone Fellowship (2022-23) from College of Engineering, Drexel University.

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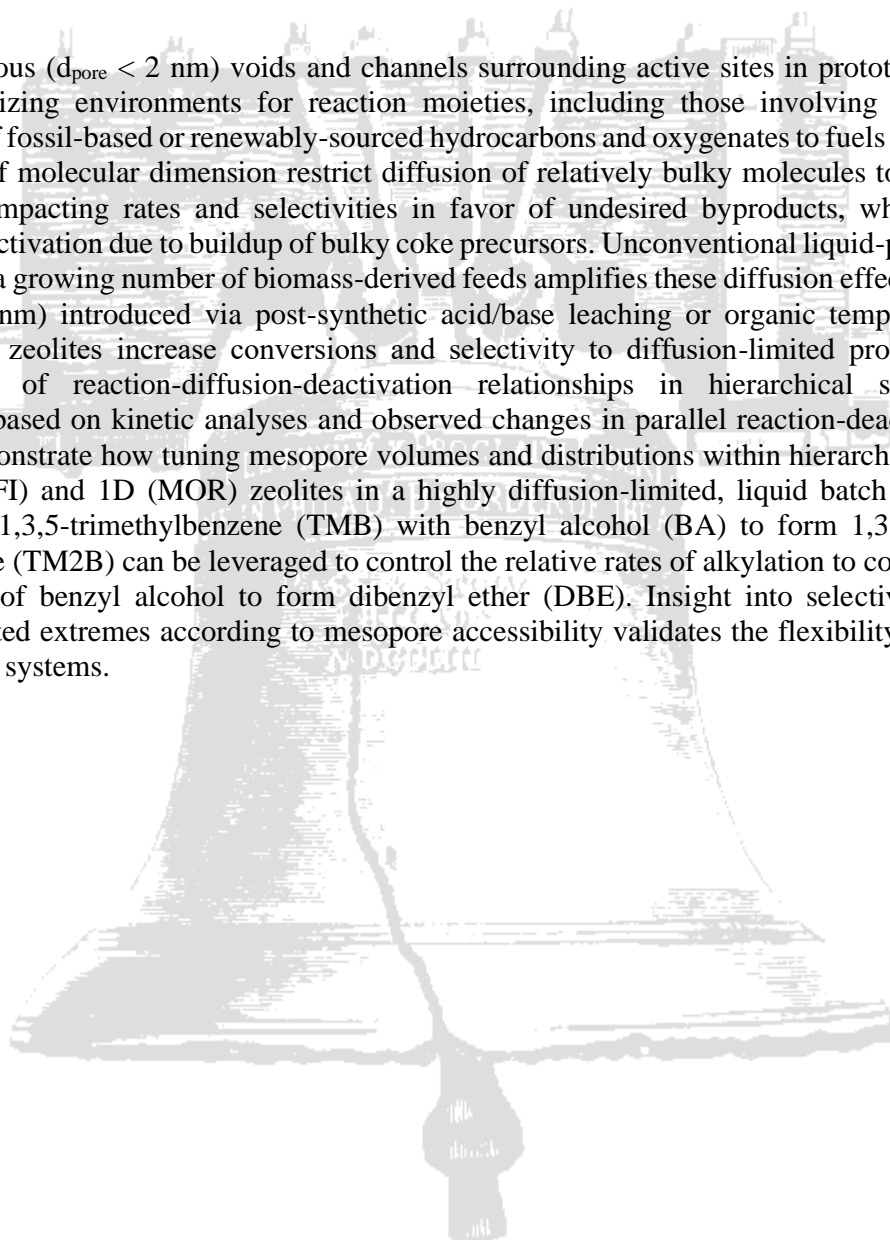
## Reaction, diffusion, and deactivation rates of aromatic alkylation and alcohol etherification on hierarchical zeolites

Michele L. Sarazen

*Department of Chemical & Biological Engineering, Princeton University, Princeton, 08544*

### Abstract

The microporous ( $d_{\text{pore}} < 2$  nm) voids and channels surrounding active sites in prototypical zeolites provide stabilizing environments for reaction moieties, including those involving acid-catalyzed conversions of fossil-based or renewably-sourced hydrocarbons and oxygenates to fuels and chemicals. These voids of molecular dimension restrict diffusion of relatively bulky molecules to and from the active sites, impacting rates and selectivities in favor of undesired byproducts, while leading to premature deactivation due to buildup of bulky coke precursors. Unconventional liquid-phase reactions employed for a growing number of biomass-derived feeds amplifies these diffusion effects. Mesopores ( $d_{\text{pore}} = 2\text{--}50$  nm) introduced via post-synthetic acid/base leaching or organic templating to form “hierarchical” zeolites increase conversions and selectivity to diffusion-limited products. Yet, an understanding of reaction-diffusion-deactivation relationships in hierarchical systems needs development based on kinetic analyses and observed changes in parallel reaction-deactivation rates. Here, we demonstrate how tuning mesopore volumes and distributions within hierarchical analogs of 3D (BEA, MFI) and 1D (MOR) zeolites in a highly diffusion-limited, liquid batch Friedel-Crafts alkylation of 1,3,5-trimethylbenzene (TMB) with benzyl alcohol (BA) to form 1,3,5-trimethyl-2-benzylbenzene (TM2B) can be leveraged to control the relative rates of alkylation to competitive self-etherification of benzyl alcohol to form dibenzyl ether (DBE). Insight into selectivity control in diffusion-limited extremes according to mesopore accessibility validates the flexibility of zeolites in novel reaction systems.



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## Michele L. Sarazen



### Biography

Michele L. Sarazen is an Assistant Professor in the Department of Chemical and Biological Engineering at Princeton University. Her research group at Princeton couples synthetic, kinetic, and theoretical investigations of porous crystalline materials as catalysts and adsorbents for sustainable fuel and chemical production with an emphasis on reaction and deactivation mechanisms. She earned her BS in Chemical Engineering, *summa cum laude*, at the Pennsylvania State University and her PhD in Chemical Engineering from the University of California, Berkeley. Her thesis, completed under the guidance of Enrique Iglesia, investigated zeolite-catalyzed alkene and alkane chain growth reactions through both experimental and theoretical approaches. She was a postdoctoral fellow at the Georgia Institute of Technology, working with Christopher Jones on the synthesis of hybrid adsorbents for direct air capture of CO<sub>2</sub> and metal-organic framework-based catalysts. Her recognitions include the National Science Foundation Graduate Research Fellowship, Howard B. Wentz, Jr. Junior Faculty Award, National Academy of Engineering Frontiers of Engineering, as well as a Division Director for the American Institute of Chemical Engineers and the Chair of the Catalysis Society of Metropolitan New York.

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## **'1+1>2': Evidence for Promoted Catalytic Performance on Binary Catalysts from Kinetic Modeling**

Bin Liu

Tim Taylor Department of Chemical Engineering, Kansas State University, Manhattan, KS  
66506

### **Abstract**

The catalysis community has widely accepted that catalytic trends based on well-defined single-site catalysts can be well described using linear scaling relationships. As such, the development of computational tools based on these linearly correlated reaction energetics and kinetics has enabled highly efficient catalyst screening for new catalyst design over the past decade. The lingering question is: binary or multi-component catalysts with distinct functionalities be described to evaluate their kinetic performances?

This talk will present a consolidated kinetic modeling framework that combines Density Functional Theory, linear scaling relationships, and kinetic modeling. Two binary catalysts with compatible active sites will be discussed. The first binary system is composed of a transition metal cluster (Ni or Fe) supported on a manganese nitride (i.e.,  $\text{Mn}_4\text{N}$ ) for Haber-Bosch ammonia synthesis.  $\text{Mn}_4\text{N}$  is a nitrogen carrier and good at cleaving the N—N bonds, but it overbinds nitrogen species. Our modeling revealed that adding Ni and Fe clusters alleviate the overbinding of nitrogen species once  $\text{N}_2$  is activated. Such a complementary 'partnership' turns inferior Ni and  $\text{Mn}_4\text{N}$  into promising materials for future experimental testing.

In a second system, we modeled the ternary transition metal nitride  $\text{Co}_3\text{Mo}_3\text{N}$  for dry reforming of methane.  $\text{Co}_3\text{Mo}_3\text{N}$  is monolithic with mixed Co and Mo nitride phases. Experimentally,  $\text{Co}_3\text{Mo}_3\text{N}$  displayed high activity and also tolerance toward carbon coking. However, the nature of active sites and the relationship between the two phases are unclear. The Co and Mo nitride sites were first probed using DFT to reveal site preferences among reaction intermediates. Then, microkinetic modeling adapted for this dual-site system was employed to yield the activities and molecular mechanisms. Our framework has been proven successful even for a substantially more complex system like dry reforming. The modeling evidence we collected is particularly encouraging for the future development of binary catalyst systems.

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## Bin Liu



### Biography

Dr. Bin Liu is the Associate Professor of Chemical Engineering at Kansas State University. He received his B.S. in Chemical Engineering from Dalian University of Technology in China in 2003, and Ph.D degree in Chemical Engineering from Colorado School of Mines in 2008. Before joining the Tim Taylor Department of Chemical Engineering at Kansas State University in 2013, he worked as a postdoctoral researcher (supervisor: Dr. Jeff Greeley) at the Center for Nanoscale Materials at Argonne National Laboratory; and then the Department of Chemical Engineering of Carnegie Mellon University (supervisor: Dr. John Kitchin).

His research focuses on molecular modeling of various catalytic processes related to sustainable chemicals and fuels production using Density Functional Theory. A main portion of his work is sponsored by National Science Foundation, and US Department of Energy Basic Energy Science Office. He has received the Outstanding Tenure-Track Assistant Professor Award in 2016, the Wayne Harms Keystone Research Scholar in 2019, and William Honstead Professorship in Chemical Engineering in 2020.

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## Direct Partial Oxidation of Methane to Methanol: New Learnings in an Old Challenge

Partha Nandi

ExxonMobil

### Abstract

Direct oxidation of methane to methanol using dioxygen as terminal oxidant remains an unmet challenge. This talk will highlight some of the key hypothesis driven approaches in ExxonMobil over the past decade to address this scientific problem. Specifically, this presentation will focus on understanding of the dioxygen activation and will build on the recent advances in the literature. We find that the partial oxidation of methane using an in situ generation of surface peroxide on Au-Pd while conducive for making hydrogen peroxide in water and in subsequent partial oxidation of methane, in the presence of O<sub>2</sub> but in the absence of hydrogen, in gas phase this catalyst is not conducive for partial oxidation of methane at low temperature. At temperature above 500°C this composition is active for making syn gas from methane. Next we turned our attention to biomimetic triCu based homogeneous catalyst where direct oxidation of methane from O<sub>2</sub> was attributed to a unique oxene insertion mechanism. We have discovered a new mechanism for this catalytic system that was hitherto unknown. Finally, we have developed a new aerobic partial oxidation of methane in presence of oxygen at high pressure using a surface oxygen initiator. This system addresses some of the mass transfer limitations of the prior work and significantly improves methanol concentration and yield.

### Partha Nandi



### Biography

Partha Nandi is an advanced research associate in the ExxonMobil Engineering and Technology Company. Partha holds a PhD in Chemistry from Michigan State University with Prof. Ned Jackson and James Dye where his thesis was on discovery and application of alkali metal in silica gel. This work was recognized by 2008 Presidential Green Chemistry Challenge Award. Prior to joining ExxonMobil, he was a postdoc with Prof. Alex Katz in UC Berkeley where he was trained in grafted single site catalysts based on metal complexes of calixarenes for catalytic oxidation and reduction reactions. Partha started his career with ExxonMobil in 2012 where his research focuses on discovery of new catalytic materials for light and heavy hydrocarbon upgrading. Partha is inventor on 22 patent applications and authored 21 journal articles



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## Fundamentals and Applications of Mechanocatalytic Processes

Carsten Sievers

School of Chemical and Biomolecular Engineering, Georgia Institute of Technology, Atlanta,  
GA 30332, USA

### Abstract

Mechanochemical process use mechanical collisions in a ball mill or similar device to drive chemical reactions. The collisions can create transient surface sites with extraordinary catalytic activity and hot spots that are characterized by rapid local temperature rises followed by dissipation of heat to the environment. In addition, mechanical forces can create intimate contact between two solids, so that the conversion of a solid reactant over a solid catalysts becomes viable.

The formation of hot spots is analyzed in a fundamental study of the conversion of  $\text{CaCO}_3$  to  $\text{CaO}$  [1]. Based on models for the impact of the milling ball and heat dissipation, each collision can be modeled as a transient batch reactor. The rates of  $\text{CO}_2$  formation in a flow-through milling vessels were determined at different milling frequencies to validate the model. The impact of a 20 mm steel ball with a net velocity of 4.5 m/s results in a hot spot temperature of above 800 °C.

These dynamic environments can be used for ammonia synthesis from the elements [2]. During milling in a mixture of  $\text{N}_2$  and  $\text{H}_2$ , titanium metal is converted into TiN. Additional collisions lead to the formation of reactive nitride species. During the decay of the hot spot, the system passes through a regime in which hydrogenation of reactive nitrides to ammonia is thermodynamically and kinetically feasible.

The ability to convert solid feedstock opens new possibilities for converting biomass and waste plastics. This approach is illustrated for the conversion of lignin, poly(styrene) and other polymers in the presence and absence of solid catalysts. Analysis of the products by GPC and GC shows reduction of the average molecular weight and the formation of monomeric products. However, repolymerization has to be accounted for as a side reaction and suppressed by suitable scavengers.

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## Carsten Sievers



### Biography

Carsten Sievers obtained his Diplom and Dr. rer nat. degrees in Technical Chemistry at the Technical University of Munich, Germany. Under the guidance of Prof. Johannes A. Lercher, he worked on heterogeneous catalysts for various petrochemical processes. In 2007, he moved to the Georgia Institute of Technology to work with Profs. Christopher W. Jones and Pradeep K. Agrawal as a postdoctoral fellow. His primary focus was the development of catalytic processes for biomass depolymerization and synthesis of biofuels. He joined the faculty at the Georgia Institute of Technology in 2009. His research group is developing catalytic processes for the sustainable production of fuels and chemicals. Specific foci are on catalyst deactivation and regeneration, mechanocatalysis, plastics recycling and upcycling, methane conversion, stability and reactivity of solid catalysts in aqueous phase, surface chemistry of complex molecules, production of value-added chemicals from biomass, operando spectroscopy, and CO<sub>2</sub> capture and conversion. He published over 90 peer-reviewed papers. He is Director of the Southeastern Catalysis Society and Editor of Applied Catalysis A: General.

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## Catalytic Upcycling of Polyolefins to Value-added Molecules by Hydrogen Redistribution

Susannah Scott

University of California, Santa Barbara.

### Abstract

A successful circular economy for carbon will depend on the ability to create value from waste plastics in ways that mechanical recycling has not delivered. Chemical strategies to disassemble polymers must be able to generate valuable carbon-based chemicals without the need for large inputs of energy or chemical resources. Partial depolymerization of polyethylene can be achieved at moderate temperatures by coupling reactions that create and consume hydrogen. This talk will describe catalyst design for tandem hydrogenolysis-aromatization to alkylaromatics and kinetic challenges in using commodity polymers as recycled carbon feedstocks.

### Susannah Scott



### Biography

Susannah Scott is a Distinguished Professor in both Chemical Engineering and in Chemistry & Biochemistry at the University of California, Santa Barbara. She received her Ph.D. in Inorganic Chemistry from Iowa State University, for her work on the activation of O<sub>2</sub> and transition metal-catalyzed oxidation mechanisms. After a postdoctoral stay at the Institut de recherches sur la catalyse in Lyon, France, she joined the faculty of the University of Ottawa (Canada) in 1994. In 2003, she moved to the University of California, Santa Barbara, where she currently holds the Duncan and Suzanne Mellichamp Chair in Sustainable Catalysis and is the Chair of the Santa Barbara Division of the University of California's Academic Senate. Scott is an Executive Editor for the journal *ACS Catalysis*, and a member of the Board of Reviewing Editors for *Science*. Her research interests focus on the design of heterogeneous catalysts with well-defined active sites for the conversion of unconventional carbon-based feedstocks, as well as environmental catalysts to promote air and water quality. She is a member of the Catalysis Center for Energy Innovation (CCEI) and the Institute for the Catalytic Upcycling of Polymers (iCOUP). In 2014, she founded the Mellichamp Academic Initiative in Sustainable Manufacturing and Product Design at UC Santa Barbara, where she now leads an interdisciplinary program in research and education. In 2022, she will chair the Gordon Research Conference on Catalysis.

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## Surprises and Disguises in Oxidative Coupling of Methane

David West

SABIC Technology and Innovation, Sugar Land TX, USA.

### Abstract

Since 1982, scientists have been searching for more active and selective catalysts for oxidative coupling of methane (OCM). An often-overlooked aspect of the problem is controlling the large rate of heat release. For example, 20% methane conversion can generate an adiabatic temperature rise of 700 K or more. Often in a laboratory experiment, the heat is released in a time that is short compared to the characteristic time for heat transfer, causing ignition (or runaway reaction) at the level of the catalyst particle or granule. This phenomenon causes ambiguities, disguises and confounding results in laboratory experiments, even those aimed at catalyst discovery. Often the results are a property of the experiment, not just the catalyst. The maximum selectivity and conversion obtained from a given catalyst depends on the reactor dimensions, number of control variables changed in the experiment and the order and rate in which they are changed. These difficulties are not unique to OCM, but it is perhaps an extreme or archetypal example. These issues can confound the results of catalyst screening experiments for any highly exothermic reaction. The often-used criterion (i.e., Mears) for avoiding such difficulties is sometimes inadequate. This talk will highlight some surprises that we encountered in the search for better OCM catalysts.

### David West



### Biography

David West is a Corporate Fellow at SABIC, focused on new materials and manufacturing processes. Before joining SABIC in 2012, he worked at Dow for 31 years. His interests include reaction engineering, transport phenomena, fluid dynamics, materials science, and non-linear dynamics. He is coauthor of 40+ journal articles, and co-inventor of 75+ granted or pending patents. West is a Fellow of the AIChE, 2012 recipient of the AIChE CRE Division Practice Award, and recently elected member of the National Academy of Engineering.