

# NACS Newsletter

JUNE 2008 • VOLUME XLII, ISSUE 2 • WWW.NACATSOC.ORG

## Dr. Jeffrey S. Beck is the 2009 Eugene J. Houdry Awardee

IT IS MY PLEASURE TO ANNOUNCE that Dr. Jeffrey S. Beck of Exxon-Mobil Research and Engineering Company, Clinton, NJ (USA) is the 2009 Eugene J. Houdry Awardee. This award is sponsored by Süd Chemie and administered by The North American Catalysis Society. The purpose of the Award is to recognize and encourage individual contributions in the field of catalysis with emphasis on the development of new and improved catalysts and processes representing outstanding advances in their useful application. The Award consists of a plaque and an honorarium. Further details about this Award and its history may be found in the Awards Folder of the NACS website, [www.nacatsoc.org](http://www.nacatsoc.org).

Among his many accomplishments, Jeff was co-inventor of M41S, an entirely new class of mesoporous molecular sieves. M41S materials represent a breakthrough in ultra large pore molecular sieve technology. Utilizing strategies gleaned from surfactant chemistry, Jeff demonstrated how to manipulate the synthesis of these materials to tailor their pore size from 20 to 100 Å. He also demonstrated that the interactions between surfactant templates and reaction conditions in these systems could be manipulated to produce either zeolitic or mesoporous materials, thus illustrating the possibility of either molecular or supramolecular templating. Discovery of these materials is recognized as a major innovation throughout the scientific community. These silicates are applicable to a wide range of applications in catalysis, separations and as host/guest materials. This work was awarded the 1994 Donald W. Breck Award by the International Zeolite Association.



Another major achievement includes Jeff's seminal work on preparing ex-situ selectivated catalysts which laid the groundwork for the ExxonMobil PxMax<sup>SM</sup> process (selective conversion of toluene to p-xylene, the precursor to terephthalic acid and polyesters), which was recently recognized with the ACS Heroes of Chemistry Award. His research in the "molecular engineering" of zeolites and the interplay between reaction pathways, kinetics, and mass transport in microporous materials led to several commercial processes for the

# Dr. Jeffrey S. Beck is the 2009 Eugene J. Houdry Awardee

selective production of para-xylene. Jeff's fundamental studies enabled him to tailor the diffusion properties of the catalyst by using novel nano-coating techniques. He carried out detailed kinetic and mechanistic studies to design catalysts for selective production of para-xylene in ExxonMobil processes such as PxMax<sup>SM</sup> and XyMax<sup>SM</sup> (awarded the 2003 Thomas Alva Edison Patent Award by the Research and Development Council of New Jersey), and his findings also played a key role in the commercial manufacture of these catalysts. These discoveries have been deployed worldwide in more than 20 commercial units for para-xylene production, with others planned, and have been recognized not just by their rather significant economic impact, but also for their environmental benefits by reducing the energy required to produce para-xylene and their societal benefit in enabling the lower cost production of the key component used in the production of polyethyleneterephthalate (PET), one of the world's most widely used polymers.

In addition, Jeff has authored or coauthored 47 scientific publications, 58 external presentations, and 59 patents, which demonstrate his creativity in the broad research area of catalysis. One supporter commented,

"He innovates, implements, and leads. Jeff's impact on ExxonMobil through catalysis has been tremendous, far exceeding hundreds of millions of dollars."

Jeff has also played a key role in bringing to ExxonMobil new research tools to further increase capabilities to efficiently carry out research and development of novel catalytic technologies. He was a key member of the team that established a broad ExxonMobil-Symyx alliance in High-Throughput R&D (HT R&D). With Jeff leading the effort, these new HT R&D tools, along with advanced modeling efforts, are successfully being implemented at ExxonMobil and have yielded innovations that have been commercialized in the refining and lubricant areas.

Jeff's current role at ExxonMobil is manager of Corporate Strategic Research of ExxonMobil Research and Engineering Company, with overarching responsibility for upstream, downstream, and chemicals long range research for the entire Corporation.

*John Armor,*

President of The North American Catalysis Society

## **National Officers**

### **PRESIDENT**

John N. Armor  
GlobalCatalysis.com

### **VICE-PRESIDENT**

Enrique Iglesias  
University of California at Berkeley

### **SECRETARY**

Umit S. Ozkan  
Ohio State University

### **TREASURER**

John W. Byrne  
BASF Catalysts LLC

### **COMMUNICATIONS DIRECTOR**

Edrick Morales  
LyondellBasell Industries

### **Club Representatives**

#### **Canada**

Flora Ng  
University of Waterloo

#### **Chicago**

Harold H. Kung  
Northwestern University

#### **Mexico**

Francisco Hernandez-Beltran  
Inst. Mexicano Del Petroleo

#### **Michigan**

Galen B Fisher  
Delphi Research Labs

#### **New England**

William C. (Curt) Conner  
University of Massachusetts

#### **New York**

Israel E. Wachs  
Lehigh University

#### **Pacific Coast**

Charles T. Campbell  
University of Washington

#### **Philadelphia**

Anne M. Gaffney  
Lummus Technology, a CB&I Company

#### **Pittsburgh – Cleveland**

Götz Vesper  
University of Pittsburgh

#### **Organic Reactions Society**

Christopher W. Jones  
Georgia Institute of Technology

#### **Tri-State (Kentucky/Ohio/West Virginia)**

Juergen Ladebeck  
Süd Chemie

#### **Southeast**

James G. Goodwin  
Clemson University

#### **Southwest**

Brendan D. Murray  
Shell Chemical LP

#### **Western States**

James E. Miller  
Sandia National Laboratories

#### **Directors-at-Large**

##### **Bruce Gates**

University of California at Davis

##### **Jingguang G. Chen**

University of Delaware

##### **Christopher L. Marshall**

Argonne National Laboratory

##### **Stuart Soled**

Exxon Mobil Research and Engineering Co.

This Newsletter is a quarterly publication of **The North American Catalysis Society**

Copyright © 2008

---

# Nominations due September 1, 2008 for Paul H. Emmett Award in Fundamental Catalysis



**T**he Paul H. Emmett Award in Fundamental Catalysis is sponsored by the Davison Chemical Division of W.R. Grace and Company. It is administered by The Catalysis Society and is awarded biennially in odd numbered years, generally at the North American meeting of The Catalysis Society, where the awardee will be asked to give a plenary lecture. The award consists of a plaque and a prize of \$5,000. An additional \$500 is available for otherwise unreimbursed travel expenses.

The purpose of the Award is to recognize and encourage individual contributions in the field of catalysis with emphasis on discovery and understanding of catalytic phenomena, proposal of catalytic reaction mechanisms and identification of and description of catalytic sites and species.

Selection of the Award winner will be made by a committee of renowned scientists and engineers appointed by the President of The North American Catalysis Society. Selection shall be made without regard for sex, nationality or affiliation. The award winner must not have turned 46 on April 1st of the award year, thus nomination documents should indicate the age and birthdate of the nominee. [The next award is the 2009 Award year for

this Emmett Award (nominations due by September 1, 2008). Thus, nominees should not yet be 46 on April 1, 2009.] Posthumous awards will be made only when knowledge of the awardees' death is received after announcement of the Award Committee's decision. Nominations for the Award should present the nominee's qualifications, accomplishments, birthdate, and biography. A critical evaluation of the significance of publications and patents should be made as well as a statement of the particular contribution(s) on which the nomination is based. Nomination documents should be submitted in one complete package to the President of the Society along with no more than two seconding letters.

Selection of the 2009 Emmett Award winner will be made by a committee of renowned scientists and engineers appointed by the President of The North American Catalysis Society. **Nomination packages for the Award must be received by on 1 September 2008.**

All nomination packages (one ELECTRONIC COPY) for the Emmett Award should be sent to John Armor, President, North American Catalysis Society; at [nacatsoc@verizon.net](mailto:nacatsoc@verizon.net). Receipt of any nomination, will be confirmed by an email message sent to each nominator.



# 2009 NAM, June 7-12 in San Francisco

The 2009 NAM will take place at the Hyatt Regency Hotel, located directly on the Embarcadero waterfront in San Francisco. The meeting cochairs are Enrique Iglesia, Charles Wilson, and Bruce Gates. Further information is available on the meeting website ([www.21nam.org](http://www.21nam.org)); inquiries should be directed to [nam21-info@pnl.gov](mailto:nam21-info@pnl.gov).

The time line is as follows:

- **August 1, 2008**, call for papers and applications for Kokes Student Travel Awards
- **November 15, 2008**, deadline for submission of abstracts and Kokes applications, to be made via the meeting web site.
- **February 9, 2009**, notification of accepted abstracts for oral and poster presentations and awarded Kokes grants.
- **April 1, 2009**, deadline for early registration.

Abstracts are welcomed in a broad range of topics in catalytic science and technology; details are available through the meeting website.

The meeting will feature plenary lectures by Gerhard Ertl, as well as by the winners of the Catalysis Society's Boudart, Emmett, and Houdry Awards.

The following industrial sponsors have already provided support for the meeting: Chevron, Haldor Topsøe, and Lummus Technology.

Those wishing to become sponsors should be in contact with the Fund Raising Chair, Jon McCarty, whose email address is [JonGMcCarty@Eaton.com](mailto:JonGMcCarty@Eaton.com). Those interested in exhibits at the meeting should consult the web site.

## New Voting Procedures

It is important that the NACS Secretary have your current email addresses, since this will be the only way for members to vote in January 2009 for the next group of Directors-at-Large. More details will follow in the next issue of the Newsletter. Any specific email address changes should be sent to the Secretary (Professor Umit Ozkan, [ozkan.1@osu.edu](mailto:ozkan.1@osu.edu)) and the Newsletter Editor, Edrick Morales, at [edrick.morales@lyondellbasell.com](mailto:edrick.morales@lyondellbasell.com).

## New Historical Video Clips Available

Thanks to the efforts of Burt Davis (the NACS videographer) and our web designer (Ray Buchta) we have launched quite a few new video clips of historical figures in catalysis. These include:

- John Bailor
- Robert Burwell
- John Butt
- Adalbert Farkas
- Robert Garten
- Ricardo Levy
- Donald Nace
- Edward Teller
- Haldor Topsøe
- John Turkevich

You can find these 5 minute video clips within the History subfolder in the NACS website.

*John Armor*

21<sup>st</sup>  
NAM

San Francisco,  
California 2009

[www.21nam.org](http://www.21nam.org)

# Automotive Emission Control: Past, Present and Future

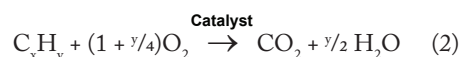
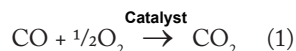
Ciাপetta Lecture  
Presented at the Philadelphia Catalysis Society  
Spring Symposium 22 May 2008

*Robert J. Farrauto, Research Fellow, BASF Catalysts,  
Iselin, New Jersey 08830  
Adjunct Professor, Earth and Environmental Engineering  
Columbia University, in the City of New York  
Bob.Farrauto@BASF.com*

## 1. Catalytic Converters for Gasoline Engine Exhausts

The first automobile catalysts, for gasoline fueled internal combustion engines (IC) were introduced in the US in 1975. They were designed to facilitate the oxidation of carbon monoxide (CO) and unburned gasoline derived hydrocarbons (HC) to  $\text{CO}_2$  and  $\text{H}_2\text{O}$  (reactions 1 and 2). The catalyst had to be effective for a reduction of 90% of the CO and HC (relative to an uncontrolled 1970 vehicle) for 50,000 miles. The automobile industry was skeptical since the success of the catalyst was dependent on the driving and maintenance cycles of the average consumer rather than a trained chemical engineer.

Precious metals were known to be excellent oxidation catalysts but their expense and rarity led many to seek alternative less expensive base metal oxides such as Cu, Co, Cr, Ni, etc. Due to lack of their hydrothermal stability and sensitivity to poisoning by sulfur present in gasoline base metals were found to be unsuccessful. This left the precious metals as the only viable catalytic components. Standards for  $\text{NO}_x$  were met with exhaust gas recirculation (EGR) in which some of the exhaust, rich in  $\text{H}_2\text{O}$ ,  $\text{CO}_2$  and depleted in  $\text{O}_2$  content, was recycled into the engine, lowering the combustion temperature thereby decreasing  $\text{NO}_x$  formation.



Since that time we have seen one of the most successful applications of catalysis for cleaning emissions from gasoline, diesel, two and 4-cycle engines, power plants, chemical

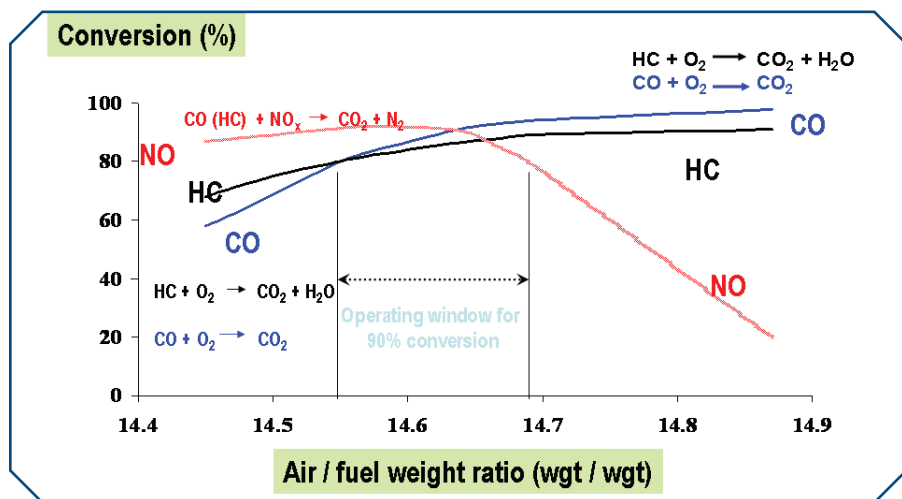


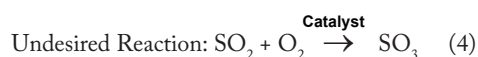
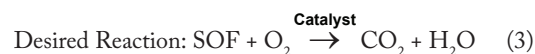
Figure 1: TWC conversion profile for controlling gasoline emissions.

plants, restaurants, and destroying ozone entering the cabin of wide body aircraft to name a few. The three way catalyst (TWC) is now the heart of a closed loop engine control strategy successfully reducing emissions of CO, HC and oxides of nitrogen ( $\text{NO}_x$ ) to near zero for 150,000 miles. This has clearly been an achievement of epic proportions with a positive impact on the environment and the health of the world [1]. Figure 1 is a familiar profile of TWC conversion performance as a function of the controlled air to fuel ratio.

## 2. Controlling Emissions from Diesel Engine Exhausts

In response to new regulations established by the US/EPA in 1994 diesel fueled trucks were required to achieve significant reductions in total particulate matter and gaseous emissions of CO, HC and  $\text{NO}_x$ . An examination of the operating mode of a diesel engine indicates that its emissions would be considerably more complicated than from a gasoline engine and thus the technology for pollution abatement had to be different. First of all the diesel fuel has a boiling range from 200–350 °C while gasoline is much more volatile (50–200 °C). Liquid diesel fuel is injected into air which has been compressed in the cylinder where it is immediately ignited. This generates dry soot and liquid emissions derived from fuel and lubricating oil (soluble organic fraction or SOF). In contrast the spark ignited gasoline engine utilizes premixed gasoline and air. Diesel engines operate very lean of stoichiometry (excess air  $\lambda \gg 1$ ) so the emission-control technology for TWC, which operates at  $\lambda = 1$ , will not convert  $\text{NO}_x$ . Therefore the engine control and catalytic abatement system had to be developed.

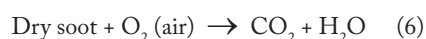
The engine companies minimized soot by using high pressure fuel injectors decreasing the droplet size. Emissions of CO and HC were low due to the lean operation of the combustion process while  $\text{NO}_x$  was addressed with exhaust gas recirculation (EGR) similar to that utilized in the early days of the gasoline catalytic converter. At first it appeared it would be relatively easy to use a Pt-containing catalyst to oxidize the SOF however in 1994 the sulfur content of diesel fuel was 500 ppm and therefore Pt was found to oxidize  $\text{SO}_2$  to  $\text{SO}_3$  forming sulfuric acid ( $\text{H}_2\text{SO}_4$ ). Thus the goal was to find a highly selective catalyst that would oxidize the liquid SOF while not oxidizing the  $\text{SO}_2$ .



Surprisingly non-precious metal catalysts such as  $\text{CeO}_2$  were found to be sufficiently selective to catalyze the oxidation of the SOF while having little activity for  $\text{SO}_2$  oxidation. Thus the first diesel oxidation catalysts, commercialized by Engelhard (now BASF Catalysts) in 1994 for trucks, were wash coated monoliths containing  $\text{CeO}_2$  as the active catalytic component. A trace of Pt was added to eliminate the odor bearing compounds from the engine with no impact on  $\text{SO}_3$  emissions.

In 1995 these catalyst were modified for European passenger car applications by addition of slightly higher levels of Pt along with a thermally stable zeolite to adsorb HC during cold start. Hydrocarbon desorption occurred at a temperature greater than light-off so cold start emissions could be met to meet standards in Europe.

Due to increasing severity of emission standards in the advancing years acceptable soot levels could not be met with high pressure fuel injection alone. Consequently the catalyzed soot filter emerged in the first decade of 2000 as a wall flow ceramic (cordierite) filter. The design calls for alternate inlet and adjacent outlet channels of the monolith to be blocked forcing the flow through the wall where the dry soot accumulates. Periodically it must be removed by air oxidation. This is accomplished by the exotherm ( $\sim 550$  °C) generated from the injection of diesel fuel into a diesel oxidation catalyst (DOC) up stream.



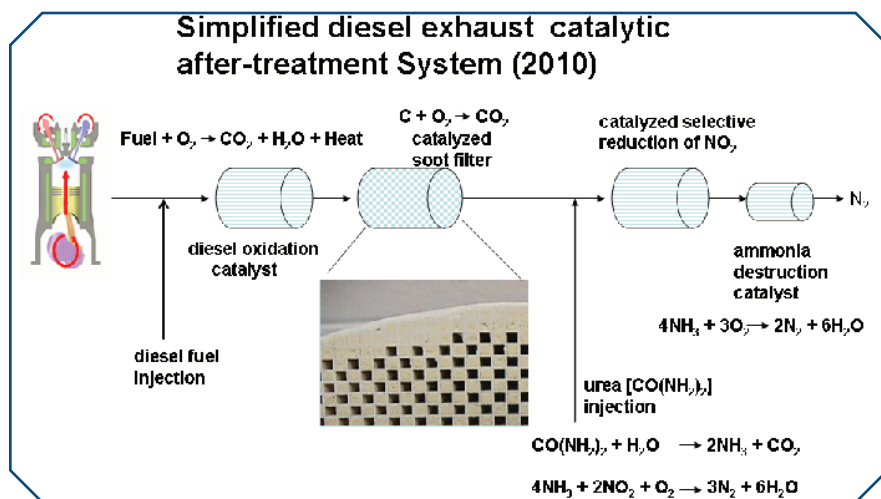
Now catalytic scientists and engineers were faced with new challenges for controlling diesel engine emissions for trucks, buses and passenger cars. As we approach 2010 Federal Standard emissions of CO, HC, NO<sub>x</sub> and particulates must approach zero levels. Reducing NO<sub>x</sub> in an oxidizing environment requires a highly selective catalyst. Fortunately NH<sub>3</sub> is a suitable reductant with oxides of vanadium and/or metal exchanged zeolite catalysts. This technology called selective catalytic reduction (SCR) is currently practiced in power plants for NO<sub>x</sub> reduction. The current thinking is to adapt this technology for diesel vehicles with the NH<sub>3</sub> produced by hydrolysis of liquid urea injected into the exhaust. This approach is generally considered applicable for large trucks and passenger cars [1].

For small passenger cars NO<sub>x</sub> traps are being considered. Alkaline metal oxides, such as BaO, are added to a TWC catalyst. The NO is first converted to NO<sub>2</sub> with Pt present in the TWC. The BaO adsorbs NO<sub>2</sub> during lean operation. Once the trap approaches saturation the exhaust is commanded towards stoichiometry ( $\lambda \sim 1$ ) allowing the TWC to catalyze the reduction of NO<sub>x</sub> to N<sub>2</sub>.

Pollution abatement is becoming more and more complicated as emission standards become increasingly more stringent. Once again it demonstrates the complex environment in which catalysts can function in consumer related applications. This is a tribute to the sophistication of catalysts and the systems into which they are integrated. The unit operations anticipated for a diesel truck are shown in Figure 2.

### 3. New Sources of Hydrocarbon Fuels

As complicated and sophisticated as catalytic conversion of pollutants has become it is not the end to which catalysts can assist in cleaning the environment. We are now experiencing the emergence of environmental emission control with greater sensitivity to greenhouse gas emission and energy security. These issues point to the need for development of new sources of transportation fuels which do not conflict with the world's need for food. Generating fuels and chemicals from non-edible biomass has already emerged as the next important challenge for catalyst technology. The two most popular approaches have been the use of new enzymes to ferment non-edible cellulose rich bio-mass to ethanol. The second approach is to gasify non-edible bio mass and convert the products (gases and bio-oils) to synthesis gas of a suitable quality to make ethanol and or Fischer-Tropsch fuels such as diesel. In addition to generating the fuels it will be also very important to adjust the catalyst after treatment technologies to abate the carbon component of these new fuels to CO<sub>2</sub>. This insures a healthy need for new catalyst technologies for the very near future while bringing us to carbon neutrality.

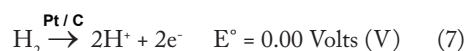


**Figure 2:** Proposed simplified diesel exhaust after-treatment system (2010). A diesel oxidation catalyst, wall flow filter, selective catalytic reduction and ammonia decomposition catalyst are shown.

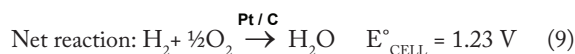
#### 4. A Quantum Change in Power Generation: The Hydrogen Economy.

The lack of secure petroleum supplies and a growing threat of global warming demands that alternative sources of energy be found. We are approaching, albeit very slowly, a possible hydrogen economy where natural sources of energy such as the sun, wind, hydroelectric, etc. can provide power to electrolyze water to generate  $H_2$  with carbon-free technology. The  $H_2$  generated can be directly converted to electricity and heat in a fuel cell providing energy for residences, portable power devices and ultimately a hydrogen vehicle. The fuel cell does not function as a heat engine, limited by thermodynamic cycles, and thus its efficiencies are higher than conventional power generating machines such as turbines and internal combustion engines. Furthermore since the fuel cell does not combust fuels there are no pollutants ( $CO$ ,  $HC$  and  $NO_x$ ) with the only product being  $H_2O$ . Given these advantages fuel cells hold great promise for our future energy needs while preserving our economy, security and environment.

The anode and cathode reactions are indicated below both of which are catalyzed by Pt dispersed on carbon.



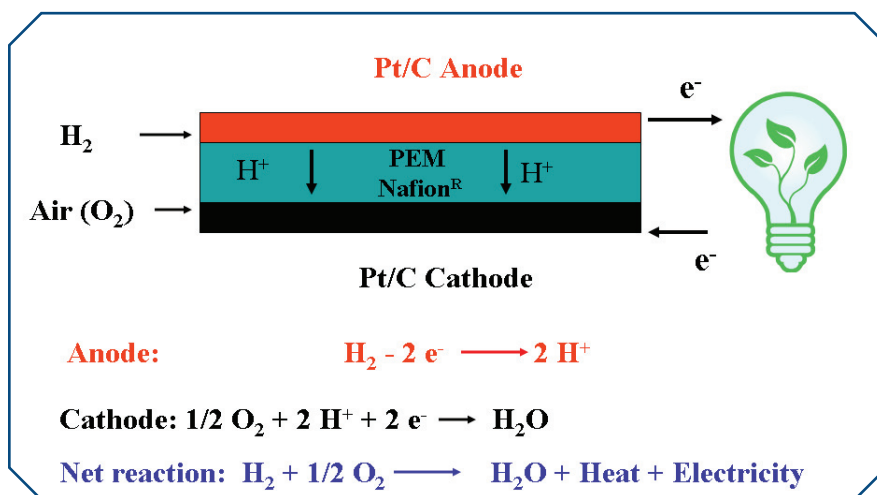
Adding the two half cell reactions gives equation



A fuel cell will run indefinitely provided  $H_2$  and  $O_2$  are supplied and the electro catalysts retain their activity. Typically the fuel cell electrochemical reactions operate at  $75^\circ C$  and atmospheric pressure

The anode and cathode compartments are separated by a solid polymer membrane composed of a fluorocarbon with a substituted sulfonic acid group to conduct  $H^+$  (Figure 3). The membrane (Nafion<sup>R</sup>) is permeable to  $H^+$  generated at the anode which migrates through it to the cathode combining with the  $O_2$  to form  $H_2O$ . The question that must be addressed is what will be the source of  $H_2$ . It is understood that natural sources of energy are far from mature so a logical  $H_2$  generating transitional solution would be to convert pipeline natural gas, for which a well established infrastructure exists, to  $H_2$ . The chemical industry reforms natural gas ( $CH_4$ ) routinely but the catalytic technology used could not be safely and economically scaled down for small scale distributed  $H_2$  applications. To address this challenge for distributed hydrogen researchers turned to the successful automotive technology and developed a family of precious metal-containing monolith catalysts that

**Figure 3:** A single cell of the low temperature Proton Exchange Membrane (PEM) fuel cell. Single cells will be stacked in series to provide the necessary voltage.





could reform natural gas and other fuels to  $H_2$  meeting size, safety and efficiency requirements for residential, portable power and hydrogen service stations [2]. Hydrogen service stations are being built world wide using monolithic technology including catalyzed heat exchangers as suggested in Figure 4.

## 5. Concluding Remarks

Given its successful past for emission control catalysis is already taking on the challenges of generating new technology moving us towards independence from fossil fuel and ultimately towards the hydrogen economy. Fuel cells have been a primary source of power for space missions and the space station but now it is time to bring this technology back to earth. Applications in portable power, residential combined heat and power and eventually the fuel cell vehicle are on the near horizon.

## 6. General References

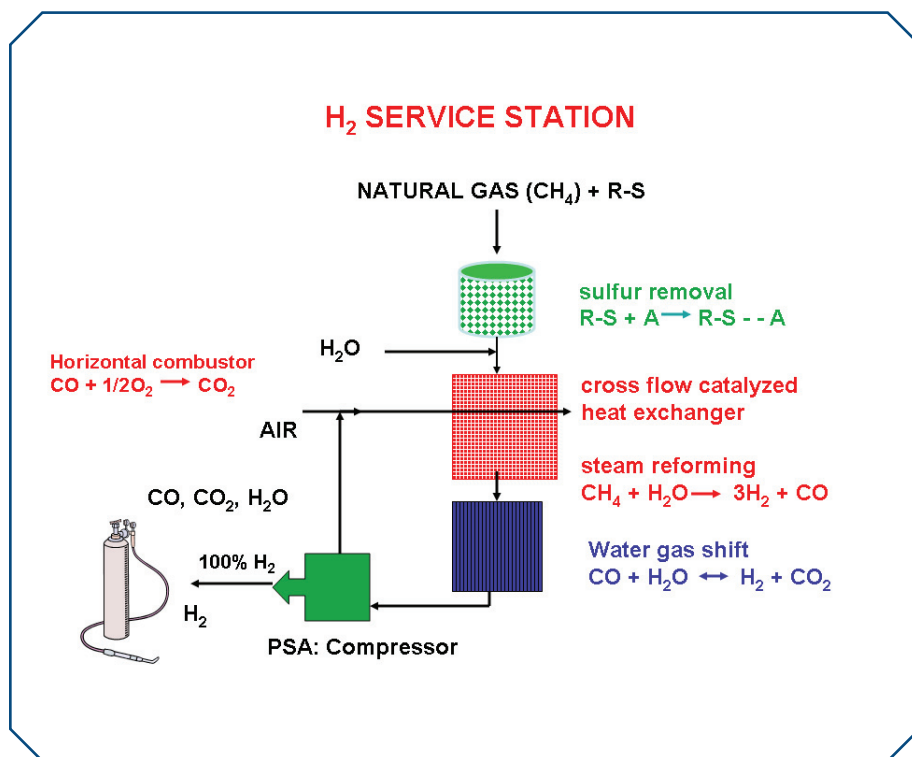
[1] Heck, R., Farrauto, R. with Gulati, S. "Catalytic Air Pollution Control: Commercial Technology" 3rd edition, Wiley and Sons, Hoboken, NJ. In press.

[2] Farrauto, R., Liu, Y., Ruettinger, W., Ilinich, O., Shore, L. and Giroux, T. "Precious Metal Catalysts Supported on Ceramic and Metal Monolithic Structures for the Hydrogen Economy" Catalysis Reviews 49,141-196 (2007).



Dr. Farrauto is a Research Fellow at the Corporate Research Laboratories of BASF Catalysts (formerly Engelhard) in Iselin, New

Jersey, USA and the 2008 F. G. Ciapetta Lecturer. His major responsibilities have included the development of advanced automobile emission control catalysts and catalysts for the chemical industry. He managed an Engelhard research team that developed and commercialized diesel oxidation catalysts for the European, North American and Asian markets for passenger cars and heavy duty trucks. Currently he manages a research team developing new catalyst technology for the hydrogen economy including hydrogen refueling stations and fuel cells for stationary, portable power and vehicular applications. He is also Adjunct Professor in the Earth and Environmental Engineering Department of Columbia University, in the City of New York where he teaches course in catalysis.



**Figure 4:** A cartoon of a hydrogen filling station on the hydrogen highway using catalytic monolith technology for reforming natural gas. The unit operations shown are sulfur adsorption, steam reforming on the process side of a heat exchanger, water gas shift, pressure swing adsorption and catalytic combustion on the shell side of the heat exchanger.

# Breaking the Chemical and Engineering Barriers to Lignocellulosic Biofuels

**Workshop Chair:** George W. Huber, University of Massachusetts-Amherst

**Sponsors:**

- National Science Foundation: Chemical, Bioengineering, Environmental and Transport Systems, John Regalbuto
- Department of Energy: Office of the Biomass, Paul Grabowski
- American Chemical Society-Green Chemistry Institute

A recent roadmap outlines the vital importance of catalysts for cellulosic biofuels. This roadmap is available electronically at [www.ecs.umass.edu/biofuels](http://www.ecs.umass.edu/biofuels) and is the result of a 2 day workshop sponsored by the National Science Foundation and Department of Energy. This workshop brought together more than 70 participants from academia, industry and government agencies to provide a unified document on how cellulosic biofuels can become a practical reality. The roadmap articulates the central role of chemistry, chemical catalysis, thermal processing, and engineering in the conversion of lignocellulosic biomass into liquid transportation fuels including green gasoline, green diesel and green jet fuel.

Six thrust areas are discussed in the roadmap including:

- Selective Thermal Processing of Lignocellulosic Biomass
- Utilization of Petroleum Refining Technologies for Biofuel Production
- Aqueous-phase Catalytic Processing of Sugars and Bio-oils
- Catalytic Conversion of Syn-gas
- Process Engineering and Design
- Cross Cutting 21<sup>st</sup> Century Science, Technology, and Infrastructure for a New Generation of Biofuel Research

This workshop builds on the success of four previous NSF and DOE workshops. The previous NSF workshops include: "Catalysis for Biorenewables Conversion" ([www.egr.msu.edu/apps/nsfworkshop](http://www.egr.msu.edu/apps/nsfworkshop)) and

"Design of Catalyst Systems for Biorenewables" ([www3.cbe.iastate.edu/nsfbioren](http://www3.cbe.iastate.edu/nsfbioren)). The previous DOE workshops include: "Breaking the Biological Barriers to Cellulosic Ethanol" ([genomicsgtl.energy.gov/biofuels/b2bworkshop.shtml](http://genomicsgtl.energy.gov/biofuels/b2bworkshop.shtml)) and "Thermochemical Conversion of Biomass" ([www.thermochem.biomass.govtools.us](http://www.thermochem.biomass.govtools.us))

For cellulosic biofuels to realize their full potential it is vital to overcome the chemical and engineering barriers. Recent advances in theoretical chemistry combined with new in-situ catalyst characterization methods allow us to understand chemistry at a fundamentally new level. Combining fundamental chemical understanding with new methods to synthesize nanostructured catalytic materials, the ability to design and simulate complicated reaction networks, and the ability to perform conceptual design and optimization problems will allow us to engineer efficient and economical processes for biofuel production.

### Web Links

- Chicago - [www.catalysisclubchicago.org](http://www.catalysisclubchicago.org)
- Mexican Academy of Catalysis - [www.acat.org.mx](http://www.acat.org.mx)
- NACS - [www.nacatsoc.org](http://www.nacatsoc.org)
- New York - [www.nycsweb.org](http://www.nycsweb.org)
- ORCS - [www.orcs.org](http://www.orcs.org)
- Philadelphia - [www.catalysisclubphilly.org](http://www.catalysisclubphilly.org)
- Pittsburgh-Cleveland - [www.pitt.edu/~gveser/PCCS](http://www.pitt.edu/~gveser/PCCS)

### Dead lines

- Sept. 1, 2008 - Emmett Award in Fundamental Catalysis
- Nov. 17, 2008 - Boudart Award
- March 1, 2009 - Burwell Lectureship Award

## Clubs & Societies News

### Michigan Catalysis Society

#### 2008 Spring Symposium

The 30th Annual Spring Symposium of the Michigan Catalysis Society was hosted by General Motors Corporation in Warren Michigan on May 8th. The Symposium was extremely well attended this year, with over 90 participants from both academia and industry and nine corporate sponsors, including California Analytical Instruments, Ecophysics, General Motors Corporation, Hiden Analytical, Johnson Matthey, Micromeritics, MKS Instruments, Thermo Scientific, and Umicore Automotive Catalysts.

The highlight of the meeting was an invited lecture by Dr. George W. Graham of the University of Michigan (retired, Ford Motor Company), winner of the 2008 Parravano Award for Excellence in Catalysis Research and Development. The Parravano Award for Excellence is presented biennially in even numbered years to formally recognize outstanding contributions to catalytic science and technology by researchers in the greater Michigan area. The Award is sponsored by the Memorial Trust Fund for Professor Giuseppe Parravano, which has been established at the Department of Chemical Engineering at the University of Michigan, and administered by the Michigan Catalysis Society. Dr. Graham was selected due to his fundamental discoveries leading to the development of durable, high-performance, automotive exhaust catalysts. For the Award Lecture, Dr. Graham presented his work on metal adsorbate interactions on

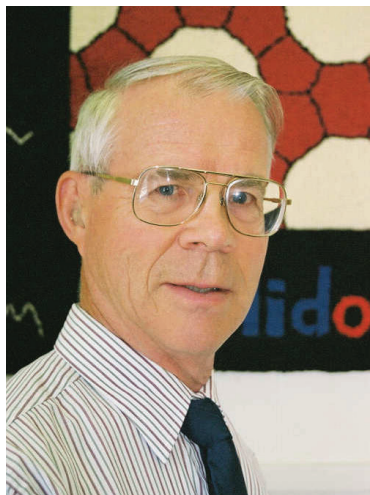
single-crystal alloy surfaces and the characterization of high-temperature aging phenomena in high-surface-area catalysts.

In addition to the Parravano Award Lecture, the 30th Annual Spring Symposium also featured an invited lecture from Dr. Frederick T. Wagner of General Motors Corporation – Fuel Cell Activities. Dr. Wagner presented his research on the electrocatalysis of oxygen reduction. The program also featured eleven oral presentations and eight poster presentations from Dow Chemical Company, Ford Motor Company, University of Michigan, Purdue University, University of Toledo, and Wayne State University. Congratulations are extended to the winners of the student competition, in which Mr. Phillip Christopher from the University of Michigan won the Outstanding Student Presentation Award and Mr. Andrew Smeltz from Purdue University won the Student Poster Presentation Award. The society also elected new officers for the 2008-09 year during the Symposium business meeting.

The 2008-2009 monthly dinner meeting series of the Michigan Catalysis Society will begin in September or October.

~

## Clubs & Societies News



### Catalysis Club of Philadelphia

#### David Olson wins the 2008 Catalyst Club of Philadelphia Award

The Catalysis Club of Philadelphia is pleased to announce that Dr. David Olson is the recipient of the 2008 Catalyst Club of Philadelphia Award. The award is given for outstanding contribution to the advancement of catalysis. Such advancement can be scientific,

technological or in organization leadership.

The 2008 Award recognizes Dr. Olson for his innovative and pioneering work in the field of zeolite crystal chemistry, adsorption and catalysis and for his organizational leadership. Dr. Olson has been involved in zeolite research for over 40 years, including 33 years at Mobil and since then has served as Adjunct Professor at the University of Pennsylvania and more recently at Rutgers University. Illustrative of his many significant scientific and technological achievements are his structural works on rare earth X and Y zeolites, ZSM-5 and their application to petrochemical processes, including the use of ZSM-5 as a xylene isomerization catalyst. He is cofounder of the Structure Commission of the International Zeolite Association and served as its chair for over six years. In addition, he organized and for many years chaired the North East Corridor Zeolite Association (NECZA). He is co-author of the Atlas of Zeolite Structure Types, which is a well-known handbook for researchers in the field of zeolites.

The Catalysis Club of Philadelphia 2008 Spring Symposium was held on May 22, 2008 at Clayton Hall, University of Delaware. The theme of the symposium was Environmental Catalysis. There were eight invited lectures. In addition, Mosha Zhao, winner of CCP 2008 Poster Competition, presented her Ph. D. thesis work at the meeting.

The invited speakers were:

- ✦ Dr. Bob Farrauto, BASF/Columbia University
- ✦ Prof. Ray Gorte, University of Pennsylvania
- ✦ Prof. Harold Kung, Northwestern University
- ✦ Dr. Chuck Peden, PNNL
- ✦ Prof. Fabio Ribeiro, Purdue University
- ✦ Prof. Chunshan Song, Pennsylvania State University
- ✦ Prof. Dion Vlachos, University of Delaware
- ✦ Dr. Andy Walker, Johnson Matthey

Professor Harold Kung was sponsored by Johnson Matthey and professor Fabio Ribeiro was sponsored by BASF.

We would like to express our appreciation for the generous support of our sponsors during the 2007-08 season.

#### Gold Sponsors:

- ✦ LyondellBasell Industries
- ✦ The Catalyst Group
- ✦ The PQ Corporation/Zeolyst International
- ✦ Arkema
- ✦ Colonial Metals, Inc.
- ✦ Hyperion Catalysis
- ✦ Symyx
- ✦ BASF
- ✦ Du Pont

#### Silver Sponsors:

- ✦ Lummus Technology, a CB&I Company
- ✦ Air Products
- ✦ Evonik
- ✦ Johnson Matthey Catalysts
- ✦ Millennium Inorganic Chemicals

~



---

# Clubs & Societies News

## **Southeastern Catalysis Society**

### **7<sup>th</sup> Annual Symposia**

---

September 28th & September 29th 2008  
Crowne Plaza Resort Asheville  
Asheville, North Carolina

#### **Program**

The meeting will begin with a poster session and cash bar at 5:00 p.m. on Sunday, September 28th followed by dinner at 7:00 p.m. Our after-dinner lecture on Sunday evening will be given by Dr. Robert Farrauto from BASF's Catalysis Research who is the winner of the North American Catalysis Society's 2008 F. G. Ciapetta Lectureship.

Contributed oral presentations will be scheduled for Monday morning beginning at 8:30 am. The meeting will adjourn around 3 pm.

#### **Abstract Submission**

Oral and poster presentations are solicited from industrial and academic scientists and engineers (including post-docs and graduate students) working in basic and applied heterogeneous catalysis research. The SCS Eastman Chemical Award will be given for the best student poster presentation. Brief abstracts (1-page maximum) should be e-mailed to Steven H. Overbury (overburysh@ornl.gov) no later than 5 pm on Friday, September 19, 2008.

Please use the attached template to prepare your abstract.

#### **Accommodations**

Participants requiring overnight accommodations should make their reservations directly with the Crowne Plaza Asheville Resort ([www.ashevillecp.com](http://www.ashevillecp.com)). Refer to the Southeastern Catalysis Society when making reservations in order to receive the SCS meeting rate of \$119/night. Only a limited number of rooms are available, so make your reservations as soon as possible! The deadline for room reservations at the guaranteed rate is August 29, 2008.

#### **Registration**

All participants (students and professionals) must register for the meeting. The registration fee is \$85 which includes dinner on Sunday evening, lunch on Monday, and a meeting abstract book. Please fill out the attached registration form and mail it with your payment. Pre-registration is preferred although participants will be able to register on-site. If you plan to register at the meeting, please let us know in advance that you plan to attend, (by email to [overburysh@ornl.gov](mailto:overburysh@ornl.gov)), so that we can arrange an appropriate number of meals.

#### **Sponsors**

**EASTMAN**



---

# 2008–2009 Officers Directory

## Canadian Catalysis Division

### Chair

Flora Ng  
University of Waterloo  
ftng@cape.uwaterloo.ca

### Secretary/Treasurer

William Epling  
University of Waterloo  
wepling@chemengmail.uwaterloo.ca

### Past Chair

Bryce McGarvey  
Imperial Oil Products Division  
bryce.mcgarvey@esso.ca

### Representative to NACS

Flora Ng  
University of Waterloo  
ftng@cape.uwaterloo.ca

## Catalysis Club of Chicago

Web site: [www.catalysisclubchicago.org](http://www.catalysisclubchicago.org)

### President

Dr. Manuela Serban  
UOP

[Manuela.Serban@uop.com](mailto:Manuela.Serban@uop.com)

### Vice President and Program Chair

Dr. Guanghui Zhu  
UOP LLC  
[Guanghui.Zhu@uop.com](mailto:Guanghui.Zhu@uop.com)

### Secretary

Dr. Siddhesh Shevade  
BP America  
[Siddhesh.Shevade@BP.com](mailto:Siddhesh.Shevade@BP.com)

### Treasurer

Dr. Wolfgang A. Spieker  
UOP  
[wolfgang.spieker@uop.com](mailto:wolfgang.spieker@uop.com)

### Director

Dr. Di-Jia Liu  
Argonne National Laboratory  
630-252-4511  
[liud@cmt.anl.gov](mailto:liud@cmt.anl.gov)

### Director

Professor Randall J. Meyer  
University of Illinois/Chicago  
[rjm@uic.edu](mailto:rjm@uic.edu)

### Director

Professor Peter C. Stair  
Northwestern University  
[pstair@northwestern.edu](mailto:pstair@northwestern.edu)

### Representative to NACS

Professor Harold H. Kung  
Northwestern University  
[hkung@northwestern.edu](mailto:hkung@northwestern.edu)

## Catalysis Club of Philadelphia

Web site: [www.catalysisclubphilly.org](http://www.catalysisclubphilly.org)

### Chair

Hai-Ying Chen  
Johnson Matthey  
[chenh@jmusa.com](mailto:chenh@jmusa.com)

### Chair-Elect

Michael A. Smith  
Villanova University  
[michael.a.smith@villanova.edu](mailto:michael.a.smith@villanova.edu)

### Past Chair

Edrick Morales  
LyondellBasell Industries  
[edrick.morales@lyondellbasell.com](mailto:edrick.morales@lyondellbasell.com)

### Treasurer

Steve Harris  
LyondellBasell Industries  
[stephen.harris@lyondellbasell.com](mailto:stephen.harris@lyondellbasell.com)

### Secretary

Bjorn Moden  
ZEOLYST International  
[bjorn.moden@pqcorp.com](mailto:bjorn.moden@pqcorp.com)

### Program Chair

Qi Sun  
LyondellBasell Industries  
[qi.sun@lyondellbasell.com](mailto:qi.sun@lyondellbasell.com)

### Arrangements Chair

Alan Lee Stottlmyer  
University of Delaware  
[alan@udel.edu](mailto:alan@udel.edu)

### Director

Haiming Liu  
Arkema Inc.  
[haiming.liu@arkema.com](mailto:haiming.liu@arkema.com)

### Director

Elizabeth Ross-Medgaarden  
LyondellBasell Industries  
[Elizabeth.Ross-Medgaarden@lyondellbasell.com](mailto:Elizabeth.Ross-Medgaarden@lyondellbasell.com)

### Director

Joseph Fedeyko  
Johnson Matthey  
[fedeyjm@jmusa.com](mailto:fedeyjm@jmusa.com)

### Representative to NACS

Anne Gaffney  
Lummus Technology, a CB&I Company  
[agaffney@CBI.com](mailto:agaffney@CBI.com)

## Catalysis Society of Metropolitan New York

Web site: [www.nycsweb.org](http://www.nycsweb.org)

### Chairman

Ruma Ghosh  
CB&I  
[RGhosh@cbi.com](mailto:RGhosh@cbi.com)

### Secretary

Jan Koegler  
CB&I  
[jKoegler@cbi.com](mailto:jKoegler@cbi.com)

### Treasurer

John Brody  
ExxonMobil  
[John.F.Brody@exxonmobil.com](mailto:John.F.Brody@exxonmobil.com)

### Chairman-Elect

Wolfgang Ruettinger  
BASF Catalysts LLC  
[wolfgang.ruettinger@basf.com](mailto:wolfgang.ruettinger@basf.com)

### Past Chairman

Colin Beswick  
ExxonMobil  
[Colin.L.Beswick@ExxonMobil.com](mailto:Colin.L.Beswick@ExxonMobil.com)

### Directors

Jeff Yang  
BASF Catalysts LLC  
[jeff.yang@basf.com](mailto:jeff.yang@basf.com)

---

# 2008–2009 Officers Directory

John Byrne  
BASF Catalysts LLC  
john.byrne@basf.com  
Qinglin Zhang  
BASF Catalysts LLC  
qinglin.zhang@basf.com  
**Representative to NACS**  
Israel Wachs  
Lehigh University  
iew0@Lehigh.EDU

## **Mexican Academy of Catalysis**

### **President**

José Antonio de los Reyes  
Universidad Autónoma Metropolitana, campus Iztapalapa  
jarh@xanum.uam.mx

### **Vice-President**

Alfredo Aguilar Elguezabal  
Centro de Investigación en Materiales Avanzados  
alfredo.aguilar@cimav.edu.mx

### **Treasurer**

Nancy Martin Guaregua  
Universidad Autónoma Metropolitana, campus Azcapotzalco  
mgnc@xanum.uam.mx

### **Secretary**

Julia Aguilar Pliego  
Universidad Autónoma Metropolitana, campus Azcapotzalco  
apj@correo.azc.uam.mx

### **Directors**

Amelia Olivas  
Universidad Nacional Autónoma de México  
aolivas@ccmc.unam.mx  
Estela Ramos  
Universidad de Guanajuato  
ramosre@quijote.ugto.mx  
Gilberto Torres  
Universidad Juárez Autónoma de Tabasco  
gilberto.torres@dacb.ujat.mx

**Representative to NACS**  
Francisco Hernandez-Beltran  
Inst. Mexicano Del Petroleo  
fjhernan@imp.mx

## **Michigan Catalysis Society**

### **President**

Suljo Linic  
University of Michigan  
jlinic@umich.edu

### **Vice President**

Paul Fanson  
Toyota Motor  
paul.fanson@tema.toyota.com

### **Past President**

Jong H. Lee  
General Motors Corporation  
jong-hwan.lee@gm.com

### **Secretary/Treasurer**

Steven Schmieg  
General Motors Corporation  
steven.j.schmieg@gm.com

### **Representative to NACS**

Galen Fisher  
Delphi Research Labs  
galen.b.fisher@delphi.com

## **New England Catalysis Society**

### **President**

Therese Campbell  
United Technologies Research Center  
campbeta@utrc.utc.com

### **Vice-President**

Ravi Datta  
Worcester Polytechnic Inst.  
rdatta@wpi.edu

### **Secretary**

Eric Altman  
Yale University  
eric.altman@yale.edu

### **Treasurer**

George Huber  
University of Massachusetts  
huber@ecs.umass.edu

**Representative to NACS**  
William Curtis Conner  
University of Massachusetts  
wconner@ecs.umass.edu

## **Organic Reactions Catalysis Society**

Web site: www.orcs.org

### **Chair**

Michael L. Prunier  
Eli Lilly & Company  
chairman@orcs.org

### **Chair-Elect**

Alan M. Allgeier  
Amgen  
allgeier@amgen.com

### **Past Chair**

Stephen R. Schmidt  
Grace Division Specialty Catalysts  
Steve.R.Schmidt@grace.com

### **Secretary-Treasurer**

Helene Shea  
Johnson Matthey Pharma Services  
treasurer@orcs.org

### **Webmaster**

Steve Quimby  
Eli Lilly & Company  
webmaster@orcs.org

### **Representative to NACS**

Christopher W. Jones  
Georgia Institute of Technology  
Christopher.Jones@chbe.gatech.edu

## **Pacific Coast Catalysis Society**

### **Chairman**

James Haw  
University of Southern California  
jhaw@usc.edu

### **Vice-Chairman**

Alex Katz  
University of California Berkeley  
askatz@berkeley.edu

---

# 2008–2009 Officers Directory

**Treasurer**

Kaidong Chen  
Chevron Technology and Marketing  
kaic@chevron.com

**Secretary**

Yong Wang  
Pacific Northwest National Lab  
yongwang@pnl.gov

**Representative to NACS**

C.Y. Chen  
Chevron Energy Technology Co.  
cychen@chevron.com

**Pittsburgh–Cleveland  
Catalysis Society**

Web site: [www.pitt.edu/~gveser/pccs/index.html](http://www.pitt.edu/~gveser/pccs/index.html)

**President**

John Kitchin  
Carnegie Mellon University  
jkitchin@andrew.cmu.edu

**President-Elect**

Jim Miller  
Carnegie Mellon University  
pccatalysis@comcast.net

**Treasurer**

Margaret Nasta  
Carnegie Mellon University  
mn0m@andrew.cmu.edu

**Secretary**

Michael Janik  
Pennsylvania State University  
mjanik@psu.edu

**Director and Representative to  
NACS**

Götz Vesper  
University of Pittsburgh  
gveser@engr.pitt.edu

**Past President**

Edwin L. Kugler  
West Virginia University  
edwin.kugler@mail.wvu.edu

**Southeastern Catalysis  
Society****President/Chairman**

Dr. Christopher T. Williams  
University of South Carolina  
willia84@engr.sc.edu

**Vice President/President-Elect**

Vacant

**Past President/Chairman**

Dr. H. Henry Lamba  
North Carolina State University  
lamb@ncsu.edu

**Secretary**

Dr. Steven H. Overbury  
Oak Ridge National Laboratory  
overburysh@ornl.gov

**Treasurer**

Dr. David A. Bruce  
Clemson University  
dbruce@clemson.edu

**Director**

Dr. James G. Goodwin, Jr.  
Clemson University  
jgoodwi@clemson.edu

**Representative to NACS**

Dr. James G. Goodwin, Jr.  
Clemson University  
jgoodwi@clemson.edu

**Southwest Catalysis  
Society****Chairman**

Yun-Feng Chang  
Exxonmobil Chemical  
yun-feng.chang@exxonmobil.com

**Chair-Elect**

Michael Wong  
Rice University  
mswong@rice.edu

**Secretary**

Andy Moreland  
Albemarle Catalyst  
andy.moreland@albemarle.com

**Treasurer**

George Stanley  
LSU, Dept. of Chemistry  
gstanley@lsu.edu

**Directors**

Tracy Hanna  
Texas Christian University  
t.hanna@tcu.edu

Scott Mitchell  
Sabic Americas Inc.  
smitchell@americas.sabic.com  
Mike Reynold  
Shell Global Solution  
mike.reynolds@shell.com

**Representative to NACS**

Brendan Murray  
Shell Chemical Lp  
brendan.murray@shell.com

**Tri-State Catalysis  
Society****President**

Uschi Graham  
Center of Applied Energy Center  
graham@caer.uky.edu

**Secretary-Treasurer**

Rajesh Khatri  
Center of Applied Energy Center  
Khatri@caer.uky.edu

**Representative to NACS**

Juergen Ladebeck  
Süd-Chemie  
jladebeck@sud-chemieinc.com

**Western States Club****President**

Will Medlin  
University of Colorado  
will.medlin@colorado.edu

**Secretary-Treasurer**

Morris Argyle  
University of Wyoming  
mdargyle@uwyo.edu

**Representative to NACS**

James E. Miller  
Sandia National Laboratories  
jemille@sandia.gov



---

(Blank page)



**21<sup>st</sup>  
NAM**

**San Francisco,  
California**

**[www.21nam.org](http://www.21nam.org)  
June 7-12, 2009**

More than 1000 of the world's leading scientists, chemists and engineers will gather at the 21st NAM to focus on original research and advancements in the broad use of catalysts in the petroleum, chemical, pharmaceutical, energy and environmental industries. Come see the latest innovations from the major industrial contributors and sponsors of NAM from around the globe.

## ORGANIZING COMMITTEE

### CHAIRMEN

BRUCE GATES, University of California at Davis,  
bcgates@ucdavis.edu  
ENRIQUE IGLESIA, University of California at Berkeley,  
iglesia@aol.com  
CHARLES WILSON, Chevron Energy Technology Company,  
charleswilson@chevron.com

### SECRETARY

YONG WANG, Pacific Northwest National Laboratory,  
yongwang@pnl.gov

### TREASURER

C.Y. CHEN, Chevron Energy Technology Company,  
cychen@chevron.com

### TECHNICAL PROGRAM CHAIRS

ALEX BELL, University of California at Berkeley,  
bell@cchem.berkeley.edu  
THEO MAESEN, Chevron Energy Technology Company,  
tmaesen@chevron.com  
CHUCK PEDEN, Pacific Northwest National Laboratory,  
chuck.peden@pnl.gov

### FUND RAISING CHAIR

JON MCCARTY, Eaton Corporation, JonGMcCarty@Eaton.com

### ARRANGEMENTS CHAIR

CYNTHIA MURPHY, Chevron Energy Technology Company,  
cynthiamurphy@chevron.com

### KOKES CHAIRS

ALEX KATZ, University of California at Berkeley,  
katz@cchem.berkeley.edu  
SUSANNAH SCOTT, University of California at Santa Barbara,  
sscott@engineering.ucsb.edu