

XINGDA Lectureship 兴大报五年报

2017

Yearbook



北京大学化学与分子工程学院
College of Chemistry and Molecular
Engineering, Peking University

北京大学化学学院科研办公室

2018年1月

Preface

At the turning point to reform and boost its research and education system in 1995, College of Chemistry and Molecular Engineering (CCME) at Peking University, China, proposed to set up a science forum to foster idea refreshments and brainstorming between its faculty and outside scientists, aiming at broadening its collaborations with institutions of chemical sciences and educations all over the world. Against all odds, CCME and Beijing Xinda Scientific Systems hit it off instantly to jointly establish the Xingda Lecture Series. Thanks to its enthusiasm for science, Beijing Xinda Scientific Systems has been financially supporting this lecture series ever since then. From the very beginning, Prof. Chunhua Yan had been serving as the organizer of this lecture series until 2015 after which Prof. Kai Wu was named as the successor.

The Xingda Lecture Series is held on every Friday throughout the academic year. Up to the time this booklet was edited, about 500 scientists had been invited to give talks at the Xingda Lecture Series which nearly cover all the research areas in chemistry and related disciplines. Needless to say, this lecture series won't be able to last without great contribution from these scientists.

With the great success of the Xingda Lecture series that has already benefited the faculty and students at CCME and the science communities inside and outside PKU as well, CCME in 2015 made the decision to upgrade this forum to the Xingda Lectureship that would be held by invited renowned and distinguished scientists from all over the world. This is also echoing the mission of Peking University in the new century which is to advance sciences and cultivate next-generation scientists for the betterment of humanity. To do this, a searching committee chaired by Prof. Kai Wu was established to select and invite scientists, normally one year in advance, to spend a period of time at CCME to share their latest achievements and exchange ideas with the faculty and students at CCME through both the Xingda Lectureship and in-lab discussions.

As a thank-you gift and historical document, we have edited this booklet to record the invited speakers and their biosketches as well as the titles and abstracts of their presentations delivered at the Xingda Lectureship in the last academic year. We'll continue to do this on a yearly basis in the future.

Last but not least, we are grateful to all who have been involved in the Xingda Lectureship and helped us in one way or another.

Kai Wu



Organizer, the Xingda Lectureship
May, 2017



2017 Xingda Lecture

Issue	Time	Speaker	Institution	Title
513	March, 24	Kenneth J Shea	University of California, Irvine	Synthetic polymers: functional alternatives to antibodies? Applications for protein stabilization, inhibition of signal transduction and as broad-spectrum antivenom
514	April, 14	Dongho Kim	Yonsei University	Characterization of Exciton Dynamics in Functional π -Electronic Systems
515	April, 21	Patrick Holland	Yale University	Nitrogen Fixation using Low-Coordinate Iron Complexes
516	April, 28	M.C.M. van de Sanden	Eindhoven University of Technology	Non-thermal chemistry: a novel pathway for renewable energy driven chemistry
517	April, 28	XiangFeng Duan	UCLA	Tailoring Charge Transport for Highly Efficient Electrochemical Energy Storage
518	May, 5	Yongwang Li	National Energy Research Center for Clean Fuels (NERC)	The Expertise from Energy Science
519	May, 12	George Shartz	Northwestern University	Silver and Gold Nanoparticles: New Directions for Theory
520	May, 19	Timothy J. Deming	UCLA	Multifunctional and stimuli responsive polypeptides
521	May, 19	Abraham Nitzan	University of Pennsylvania	Transport and optical response in illuminated molecular junctions
522	May, 26	Dale L. Boger	The Scripps Research Institute	Redesign of Vancomycin for Resistant Bacteria
523	May, 26	Andrew Wee	National University of Singapore	The Molecule-2D Heterointerface
524	June, 2	Zhiyuan Wang	Changchun Institute of Applied Chemistry	聚合物宽谱光电探测器: 材料与器件研究进展
525	June, 9	Renato Zenobi	ETH Zürich	"Exhalomics" - Real-time Medical Diagnosis using Ambient Ionization Mass Spectrometry.
526	September, 15	H. Isobe	The University of Tokyo	Physics seen through cylindrical molecules: An approach of a synthetic chemist
527	September, 15	Ruth Nussinov	National Cancer Institute at Frederick, Tel Aviv University	Alzheimer's Amyloidogenic Peptides in Late and Early Disease Stages

528	September, 29	David Liu	Harvard University, HHMI	Protein Evolution and Engineering to Enable Biotechnology, Genome Editing, and Novel Therapeutics
529	September, 29	Christopher N. Bowman	University of Colorado	Clicking Polymers Together: Assembly of Complex, Controlled Polymer Structures from Efficient Chemistries
530	October, 13	Christopher W. Jones	Georgia Institute of Technology	Amine-Modified Silicates as CO ₂ Sorbents and Catalysts
531	October, 20	Gerard van Konten	Utrecht University	Pincer-Metal Chemistry: Novel Opportunities for Catalysis and Materials
532	October, 27	Jian Zheng	National Institutes for Quantum and Radiological Science and Technology	环境放射性核素质谱超痕量分析研究进展
533	October, 27	Prof. R. Bruce Weisman	Rice University	Fluorescence of Single-Walled Carbon Nanotubes: From Discovery to Applications
534	November, 3	S. TED OYAMA	The University of Tokyo, Virginia Polytechnic Institute and State University	Kinetic and Spectroscopic Studies of Catalytic Mechanisms: Hydrodeoxygenation of Biomass Feedstocks on Transition Metal Phosphides
535	November, 10	Karen L. Wooley	Texas A&M University	Functional Polymer Materials Designed for Advanced Applications and Sustainability
536	November, 17	Bert Weckhuysen	Utrecht University	Hunting for the Hidden Chemistry in Solid Catalysts: Towards a Molecular Movie
537	November, 17	Shelley Minter	The University of Utah	Enzymatic bioelectrocatalysis: From metabolic pathways to metabolons
538	November, 24	Alois Fürstner	Max-Planck-Institut für Kohlenforschung	Recent Advances in Carbene Chemistry: Concepts and Applications

Synthetic polymers: functional alternatives to antibodies? Applications for protein stabilization, inhibition of signal transduction and as broad-spectrum antivenom

Abstract

We suggest that advances in polymer synthesis, structural biology and nanotechnology have progressed to the point where we can design synthetic polymer nanoparticles (NPs) with antibody-like affinity and selectivity for targeted biomacromolecules. The talk will describe abiotic protein/peptide and carbohydrate affinity agents (“plastic antibodies”). These agents, synthetic polymer NP hydrogels, are formulated with functional groups complementary to the biomacromolecule target. Unique to these materials is that their affinity can be switched on/off by external stimuli including temperature, pH and ionic strength, a strategy exploited in “catch and release” of target proteins. The talk will be concerned with exploring the applications of these materials for protein separation and as potential therapeutic agents to replace antibody drugs.



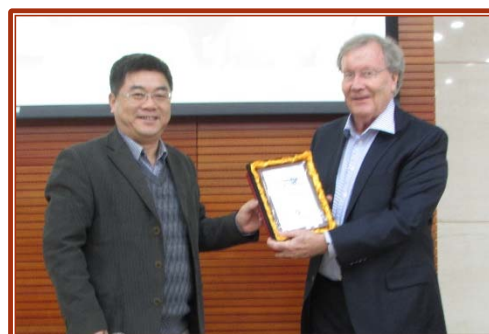
Prof. Kenneth J. Shea

University of California, Irvine, USA

Kenneth J. Shea was born in New York, New York. He received his B.S. degree from the University of Toledo and Ph.D. degree from the Pennsylvania State University. Following postdoctoral studies at Cal Tech, he joined the faculty at the University of California, Irvine, where he is currently Distinguished Professor of Chemistry and Chemical Engineering & Material Science. His research interests include the development of new polymerization reactions, synthetic antibodies, and the molecular design of hybrid organic–inorganic materials. Professor Shea has mentored over 150 graduate and postdoctoral students and 20 visitors at the University of California. Professor Shea and his students have published over 290 manuscripts, presented 180 papers at various scientific meetings and symposia and has been awarded 7 US Patents. He has given over 325 invited and plenary lectures at international symposia, academic and industrial institutions.

Honors and Awards

His professional services and awards include President, Society of Molecular Imprinting (2006-2012), American Chemical Society Cope Scholar Award 2007, Standing Member, Physical and Life Science Directorate External Review, Lawrence Livermore National Laboratories (2009-present), Visiting Professor, State Key Laboratory of Chemical Engineering, Department of Chemical and Biological Engineering, Zhejiang University, Hangzhou, China (2012-present), University of Toledo Outstanding Alumni for 2012-2013, ACS Polymeric Materials, Science and Engineering Fellow, 2013, Fellow of the ACS Polymer Chemistry Division, 2015, and Distinguished Professor of Chemistry, 2016.



Characterization of Exciton Dynamics in Functional π -Electronic Systems

Abstract

Various synthetic strategies have been developed to devise a variety of artificial molecular arrays in molecular photonics because of their similarities in architecture and subunit structures to the natural photosynthetic light-harvesting complexes. For the molecular arrays to be efficient devices, they should have very regular pigment arrangements which allow a facile light energy or charge flow along the array but do not result in the alteration of individual properties of the constituent pigments leading to the formation of energy or charge sink. In these respects, understanding of photophysical properties of these macromolecular architectures is essential for the rational design of molecular devices for photovoltaic, or optoelectronic applications.

Here, we have revealed that the ultrafast excitation energy migration processes in molecular arrays are strongly influenced by the electronic couplings among the constituent molecules as well as the structural rigidity of overall architectures. Our investigations have been extended to H-type aggregated perylenebisimide (PBI) and polythiophene oligomers (linear vs. cyclic). Not only intermolecular exciton couplings but intramolecular electronic structures have been investigated in a series of expanded porphyrins in conjunction with their molecular structures, the number of π -electrons (Hückel's $[4n+2]$ rule) as well as their conjugation pathways. Our study demonstrates a relationship between the photophysical properties such as absorption/emission properties, excited state dynamics and the aromaticity of expanded porphyrin systems. Based on these spectroscopic observations, we have found the reversal of aromaticity in the excited states of aromatic/antiaromatic expanded porphyrin congeners. Detailed studies of the modulation events are expected to provide additional fruitful insight into the relationship between (anti)aromaticity and electronic structures. To the extent this proves true, it could have far-reaching practical applications that complement the advances in theoretical understanding that our studies are likely to provide.

Prof. Dongho Kim



Department of Chemistry, Yonsei University, Seoul, Korea

1976 Seoul National University, Department of Chemistry (B.S.)

1980 Seoul National University, Graduate School, Department of Chemistry

1984 Washington University, Department of Chemistry (Ph. D.)

1984-1986 Research Associate, Princeton University

1986-2000 Research Scientist, Spectroscopy Laboratory, Korea Research Institute of Standards and Science

1997-2006 Director of National Creative Research Initiatives, Center for Ultrafast Optical Characteristics Control (CUOCC)

2006-2009 Director of Institute for NanoBio Molecular Assemblies (BK21 Program)

2008-2013 Director of Center for Smart Nano-conjugates (WCU Program)

2000-present Underwood Distinguished Professor, Department of Chemistry, Yonsei University

Honors and Awards

2006 10th Korea Science Award in Chemistry (Presidential Award), 2006 Star Faculty Award (The Ministry of Education and Human Resources), 2007-present Underwood Professor (Named Endowed Chair Professor of Yonsei Univ.), 2008 and 2015 Selected as an Advisory Board Member of Journal of Physical Chemistry, 2009 Selected as an Editorial Board Member of Journal of Porphyrins and Phthalocyanines, 2012 Chair, 7th International Conference on Porphyrins and Phthalocyanines, 2015 Co-chair, 27th International Conference on Photochemistry, 2015&2016 S-Oil Outstanding Dissertation Award (The Korea Academy of Science and Technology, S-Oil)



Nitrogen Fixation using Low-Coordinate Iron Complexes

Abstract

Iron plays a central role in the two major processes that convert nitrogen in the atmosphere to fertilizers needed for the food on our plates. The enzyme nitrogenase uses an iron-sulfur cluster, while the Haber-Bosch process uses a solid iron catalyst. Despite intense research, the catalytic mechanisms are not understood at an atomic level of detail for either catalyst, and this motivates the study of well-defined iron complexes and how they interact with N_2 . I will discuss our synthesis of low-coordinate iron coordination compounds, which have led to new insights into both N_2 binding and cleaving processes. These have included the first iron complexes with in which the nitrogen-nitrogen bond of N_2 is broken, as well as biomimetic Fe- N_2 complexes. These new research results help chemists to understand elementary steps in the conversion of N_2 to ammonia, and the talk will highlight parallels between solution, enzyme, and surface chemistry.



Prof. Patrick Holland

Professor of Chemistry, Yale University

2013- Professor of Chemistry, Yale University

2010-2013 Professor of Chemistry, University of Rochester

2005-2010 Associate Professor of Chemistry, University of Rochester

2000-2005 Assistant Professor of Chemistry, University of Rochester

1997-2000 National Institutes of Health Postdoctoral Fellow, University of Minnesota

1993-1997 Ph.D. in Chemistry, University of California, Berkeley

1989-1993 A.B. magna cum laude (high honors) in Chemistry, Princeton University

Honors and Awards

Friedrich Wilhelm Bessel Research Award of the Humboldt Foundation, 2016

Fellow of the American Association for the Advancement of Science, 2015

Blavatnik Award for Young Scientists, 2013

Fulbright Scholar Award, 2012

ACS Rochester Section Volunteerism Award, 2010

Sloan Research Fellowship, 2003

NSF CAREER Award, 2002

NIH Postdoctoral Fellowship, University of Minnesota, 1997-1999

American Institute of Chemists Student Awardee, 1993

Phi Beta Kappa, Princeton University, 1993



Non-thermal chemistry: a novel pathway for renewable energy driven chemistry

Abstract

The chemical building blocks nitrogen and carbon dioxide, next to water, will be important ingredients in a renewable energy driven society to provide high energy density fuels and chemicals. Yet both molecules provide challenges and are difficult to activate for further chemical processing. Alternative non-fossil routes for e.g. the Haber-Bosch process for ammonia production, but based on renewable energy input, are necessary. The talk will give an overview about the latest developments using non-thermal/non-equilibrium pathways, with the emphasis on plasma chemical pathways.



Prof. Richard van de Sanden

Dutch Institute for Fundamental Energy Research, Eindhoven University of Technology, Eindhoven, The Netherlands

1987 Master Degree, Department of Applied Physics, Eindhoven University of Technology

1991 Ph.D., Department of Applied Physics, Eindhoven University of Technology, Eindhoven

1990 Assistant-Professor of Plasma Physics/Chemistry, Eindhoven University of Technology

2000 Full- Professor of Plasma Physics/Chemistry, Eindhoven University of Technology

2010 Director Dutch Institute for Fundamental Energy Research (DIFFER)

Honors and Awards

Plasma Prize of the Plasma Science and Technology Division of the AVS (2014) for his contributions to the field of plasma deposition of materials, and for research into the fundamental mechanisms underpinning the deposition process

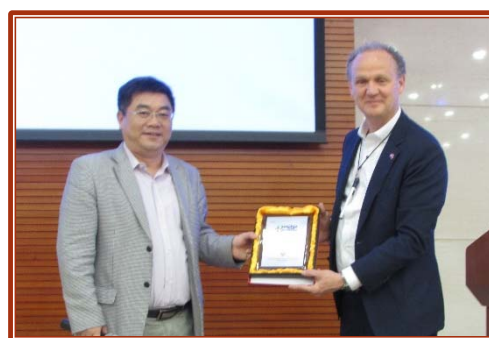
Member of the Netherlands Royal Academy of Arts and Sciences (2013)

Member of Royal Holland Society of Sciences (2010)

FOM Valorisation Prize (2009)

Leverhulme Technology Transfer Award (2008)

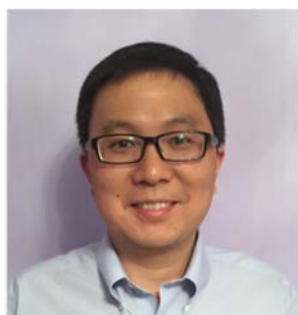
William Crookes Plasma Prize of the EPS for 'major contributions to fundamental plasma-wall interaction studies of expanding plasmas and their use in plasma enhanced deposition and etching' (2008)



Tailoring Charge Transport for Highly Efficient Electrochemical Energy Storage

Abstract

Supercapacitors, batteries and fuel cells represent three distinct electrochemical energy conversion technologies that of increasing importance for applications in mobile electronics, electric vehicles, and renewable energy industry. A common feature of these devices involves ion transport (and storage) in active electrode materials coupled with electron transport in the external circuits. Tremendous research efforts have been devoted to developing new electrode materials (e.g., silicon and niobia) with the potential to enable far higher energy or power density. However, these new materials have thus far failed to deliver their promise in practical devices because the exceptional performance is typically only achievable in ultrathin electrodes with very low mass loadings ($< 1 \text{ mg cm}^{-2}$) and cannot be easily scaled into devices with practical levels of mass loading ($>10 \text{ mg cm}^{-2}$). To sustain the same electrochemical performance in practical electrodes with higher mass loading requires the delivery of proportionally more charge (electrons and ions) across a proportionally longer distance, which represents a formidable challenge largely overlooked to date. In this talk, I will discuss the critical role of charge transport in electrochemical devices and give a few examples how the performance of various electrochemical devices can be dramatically improved by tailoring the charge transport process. In particular, I will describe the design of a three-dimensional holey graphene framework simultaneously with excellent electron and ion transport properties, to enable a series of supercapacitor or battery electrodes with unprecedented combination of energy and power density at high mass loading ($10\text{-}20 \text{ mg cm}^{-2}$), marking a critical step towards realizing the potential of these materials in practical devices. Lastly, I will briefly discuss a unique design of one-dimensional platinum nanowire electrocatalysts with much more efficient charge transfer from the catalytic active sites to the current collector to greatly enhance their performance as highly efficient fuel cell catalysts.



Prof. Xiangfeng Duan (段镶锋)

Department of Chemistry and Biochemistry, University of California, Los Angeles, USA

Dr. Duan received his B.S. Degree from University of Science and Technology of China in 1997, and Ph.D. degree from Harvard University in 2002. He was a Founding Scientist and then Manager of Advanced Technology at Nanosys Inc., a nanotechnology startup founded based partly on his doctoral research. Dr. Duan joined UCLA with a Howard Reiss Career Development Chair in 2008, and was promoted to Associate Professor in 2012 and Full

Professor in 2013. Dr. Duan's research interest includes nanoscale materials, devices and their applications in future electronic, energy and health technologies. A strong emphasis is placed on the hetero-integration of multi-composition, multi-structure and multi-function at the nanoscale, and by doing so, creating a new generation of integrated nanosystems with unprecedented performance or unique functions to break the boundaries of traditional technologies. Dr. Duan has published over 200 papers with over 30,000 citations, and holds over 40 issued US patents.

Honors and Awards

Dr. Duan has received many awards, including MIT Technology Review Top-100 Innovator Award, NIH Director's New Innovator Award, NSF Career Award, Alpha Chi Sigma Glen T. Seaborg Award, Herbert Newby McCoy Research Award, US Presidential Early Career Award for Scientists and Engineers (PECASE), ONR Young Investigator Award, DOE Early Career Scientist Award, Human Frontier Science Program Young Investigator Award, Dupont Young Professor, Journal of Materials Chemistry Lectureship, International Union of Materials Research Society and Singapore Materials Research Society Young Researcher Award, the Beilby Medal and Prize, and the Nano Korea Award.



The Expertise from Energy Science

Abstract

This lecture is going to talk about how to achieve innovative industrial technologies from fundamental research in energy science, based on the fairy and hard story of Synfuels China Technology Co. Ltd, a leading technical company founded in 2006. The state-of-art technologies for hydro-pyrolysis of coal, biomass and heavy oil at mild conditions are among the major energy challenges in China and all over the world. To solve the key issues, several fundamental projects in Synfuels China including the CFD simulation of process equipments, quantum mechanics applications in catalysts and other material studies, and computation-based programs have been initialized to understand the science and know-hows behind. Two major technological developments for Fischer-Tropsch synthesis and heavy oil refining will be demonstrated. The F-T technology has now registered large-scale applications with the capacity of 10 million tons of liquids from coal in industries in China. However, successful industrialization of these cutting-edge technologies requires mature developments of F-T and syncrude upgrading catalysts, key equipments like reactors, CTL/GTL process integration and financial investments as well. Meanwhile, a novel technology called stage-wise liquefaction of heavy feed stocks has been designed and developed to process heavy oil in refineries, which is potentially to reform and re-shape the whole industry for heavy oil processing in the world.

Prof. Yong-Wang Li (李永旺)



National Energy Research Center for Clean Fuels (NERC), Synfuels China Technology Co. Ltd, Huairou, Beijing, China

2006- Full Professor, Chief Scientist, Founder, National Energy Research Center for Clean Fuels (NERC)

1997- Full Professor, vice-director, State Key Laboratory of Coal Conversion, Institute of Coal Chemistry, CAS

1999 - 2000 Avh research fellow, University of Erlangen-Nurnberg, Germany

1996 - 1997 Postdoctoral research fellow, Catholic University of Louvain, Belgium.

1995 - 1996 Postdoctoral research fellow, Ghent University, Belgium.

1990 - 1994 Ph.D, Institute of Coal Chemistry, Chinese Academy of Sciences, Shanxi.

1986 - 1989 Master, Institute of Coal Chemistry, Chinese Academy of Sciences, Shanxi

1984 - 1986 Practical Training for Chemical Engineer, Qinghai electrochemical factory, Qinghai

1980 - 1984 B.S., Department of Chemical Engineering, Inner Mongolia University of Technology

Honors and Awards

2014 Applied Science Award granted by Zhou Guangzhao Foundation, 2010 National Energy Science and Technology Progress Award (The First) granted by the National Energy Bureau of China, 2005 Excellence Achievement Award for Science and Technology, CAS, 2005 National Invention Prize (The Second) granted by National Science and Technology Awards Committee of China, 2002 Science and Technology Progress Award of Shanxi Province (The First), 1999 AvH Scholarship/fellow.



Silver and Gold Nanoparticles: New Directions for Theory

Abstract

Silver and gold nanoparticles have a history that dates to the Roman empire and before, as well as detailed work by Michael Faraday in the 1840s. However they have been given new life (and applications) in the last 40 years through a number of advances in nanoscience. This talk will provide an overview of these advances, including new methods for making them, new spectroscopic techniques for measuring their properties and the properties of molecules near the nanoparticle surfaces, and new optical applications in sensing, photochemistry, photonic materials, solar cells and optoelectronic devices which continues to drive research in this field. An emphasis in this talk will be on the use of theory to understand the optical properties of these plasmonic materials. The cornerstone of this work is computational electromagnetics, which provides the ability to solve Maxwell's equations, but we will also describe the combination of classical electromagnetics with quantum mechanics, and its use in understanding the fundamentals of plasmon excitation as well as surface enhanced Raman spectroscopy. A recent highlight is the use of tip-enhanced Raman spectroscopy to study single molecule electrochemistry.



Prof. George C. Schatz

Department of Chemistry, Northwestern University, USA

1971 B. S. Clarkson University

1976 Ph. D., Caltech

1975-6 Postdoc, MIT

1976- Morrison Professor of Chemistry, Northwestern University, Evanston IL USA

2005- Editor-in-Chief, Journal of Physical Chemistry

Selected Publications

Kelly, K. L.; Coronado, E.; Zhao, L. L.; Schatz, G. C. The Optical Properties of Metal Nanoparticles: The Influence of Size, Shape, and Dielectric Environment, *J. Phys. Chem. B* **2003**, *107*, 668-77.

Macfarlane, R. J.; Lee, B.; Jones, M. R.; Harris, N.; Schatz, G. C.; Mirkin, C. A. Nanoparticle Superlattice Engineering with DNA, *Science* **2011**, *334*, 204-08.

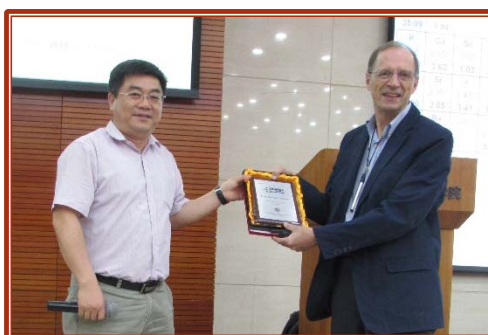
Ding, W.; Hsu, L.-Y.; Schatz, G. C. Plasmon-coupled resonance energy transfer: a real-time electrodynamic approach, *J. Chem. Phys.* **2017**, *146*, 064109 (2017)

Honors and Awards

Member, US National Academy of Sciences; American Academy of Arts and Sciences

Debye and Langmuir Awards, ACS; Bourke Medal and Boys-Shavitt Award, RSC

Feynman Prize, Hirschfelder Award, Mulliken Medal



Multifunctional and stimuli responsive polypeptides

Abstract

Our lab has pursued development of synthetic methods to allow incorporation of unprecedented levels of functionality into polypeptide materials. We report on the design and properties of stimuli responsive polypeptide motifs that are able to respond differently to different individual stimuli, such as redox, temperature, or enzymes. These materials allow multimodal switching of polypeptide properties to obtain desirable features, such as coupled responses to multiple external inputs. The reversible, multi-responsive nature of these polypeptides makes them particularly attractive as components in molecular devices or nanoscale assemblies capable of sequential, or triggered, responses to different stimuli, akin to switches capable of performing Boolean-like operations. The incorporation of these motifs into self-assembled materials such as hydrogels will be described.



Prof. Timothy Deming

Chemistry and Biochemistry Department and Bioengineering Department, UCLA

Timothy J. Deming received a B.S. in Chemistry from the University of California, Irvine in 1989, and graduated with a Ph.D. in Chemistry from the University of California, Berkeley, in 1993. After a NIH postdoctoral fellowship at the University of Massachusetts, Amherst with David Tirrell, he joined the faculty in the Materials Department at the University of California, Santa Barbara in 1995. Here he held a joint appointment in the Materials and Chemistry Departments where he was promoted to Associate Professor in 1999 and Full Professor in 2003. His appointment is now as Professor of Bioengineering and Professor of Chemistry and Biochemistry at the University of California Los Angeles. He served as the

Chairman of the Bioengineering Department at UCLA from 2006 to 2011. He is a leader in the fields of polypeptide synthesis, self-assembly of block copolypeptides, and use of polypeptides in biology.

Honors and Awards

Timothy J. Deming has received awards from the National Science Foundation, the Office of Naval Research, The Arnold and Mabel Beckman Foundation, the Alfred P. Sloan Foundation, the Camille and Henry Dreyfus Foundation, the Materials Research Society, and the IUPAC Macromolecular Division. He is a Fellow of the American Institute of Medical and Biological Engineering, and recently received the Fulbright-Tocqueville Distinguished Chair Award.



Transport and optical response in illuminated molecular junctions

Abstract

The interaction of light with molecular conduction junction is attracting growing interest as a challenging experimental and theoretical problem on one hand, and because of its potential application as a characterization and control tool on the other. From both its scientific aspect and technological potential it stands at the interface of two important fields: molecular electronics and molecular plasmonics. I shall review the present state of the art of this field and our work on optical response, switching, Raman scattering, temperature measurements, light generation and photovoltaics in such systems.



Prof. Abraham Nitzan

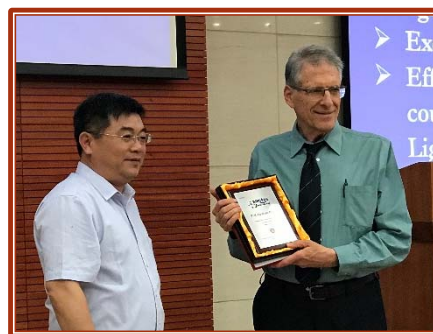
Department of Chemistry, University of Pennsylvania
 1961-1964 Hebrew University, Jerusalem Chemistry B.Sc.
 1964-1965 Hebrew University, Jerusalem Chemistry M.Sc.
 1970-1972 Tel-Aviv University Chemistry Ph.D.
 1972-1974 M.I.T. Research Associate
 1974-2014 Tel Aviv University Professor
 2015-present University of Pennsylvania Professor
 Web: <http://www.tau.ac.il/~nitzan/nitzan/>

Selected Publications

- 1, K. Kaasbjerg and A. Nitzan, *Phys. Rev. Lett.*, **114**, 126803(1-5) (2015)
- 2, A. Migliore and A. Nitzan, *J. Am. Chem. Soc.*, **135**, 9420-32 (2013)
- 3, H. Nakanishi, K. J. M. Bishop, B. Kowalczyk, A. Nitzan, E. A. Weiss, K. V. Tretyakov, M. M. Apodaca, R. Klajn, J. F. Stoddart and B. A. Grzybowski, *Nature*, **460**, 371-375 (2009)

Honors and Awards

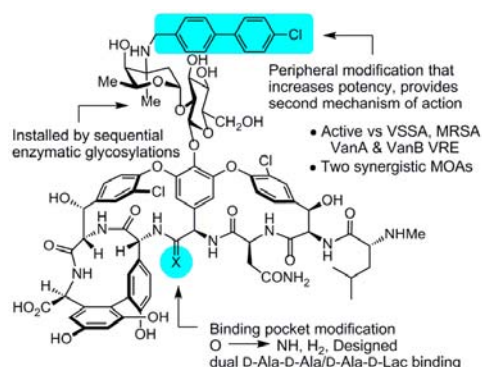
the Humboldt Award, the Israel Chemical Society Prize (2004) and Medal (2015), the Emet Prize and the Israel Prize in Chemistry. He is a Fellow of the American Physical Society and of the American Association for the Advancement of Science, a Foreign Honorary member of the American Academy of Arts and Sciences, a Foreign Associate of the US National Academy of Sciences and a member of the Israel Academy of Arts and Sciences.



Redesign of Vancomycin for Resistant Bacteria

Abstract

A summary of studies on the total synthesis and evaluation of the vancomycin family of glycopeptides antibiotics, their ligand binding pocket redesign to address the underlying molecular basis of resistance, and their subsequent peripheral tailoring to address the emerging public health problem of vancomycin resistance will be presented.



Prof. Dale L. Boger

The Scripps Research Institute

Email: boger@scripps.edu; Group website: <http://www.scripps.edu/boger/>

1975 B.S. University of Kansas,
 1980 Ph.D. Harvard University,
 1919-1985 Assistant/Associate Professor of Medicinal Chemistry, University of Kansas
 1985-1991 Associate Professor/Professor of Chemistry, Purdue University
 1991- Richard and Alice Cramer Professor of Chemistry, The Scripps Research Institute

Selected Publications

1. Okano, A.; Nakayama, A.; Wu, K.; Lindsey E. A.; Schammel, A. W.; Feng, Y.; Collins K. C.; Boger, D. L. *J. Am. Chem. Soc.* **2015**, *137*, 3693–3704.
2. J. Xie, A. Okano, J. G. Pierce, R. C. James, S. Stamm, C. M. Crane, and D. L. Boger, *J. Am. Chem. Soc.* **2012**, *134*, 1284–1297.
3. J. Xie, J. G. Pierce, R. C. James, A. Okano, and D. L. Boger, *J. Am. Chem. Soc.* **2011**, *133*, 13946–13949.

Honors and Awards

Searle Scholar Award, ACS Arthur C. Cope Scholar Award, ISHC Katritzky Award in Heterocyclic Chemistry, Paul Janssen Prize for Creativity in Organic Synthesis, ACS Guenther Award in Natural Products, ACS Hirshmann Award in Peptide Chemistry, RSC Robert Robinson Award, Elected to US National Academy of Sciences.



The Molecule-2D Heterointerface

Abstract

We have previously shown that the electronic and chemical properties of graphene can be controllably tuned via molecular functionalization. In this talk, I will focus on our more recent work on semiconducting 2D transition metal dichalcogenides (TMDs) with tunable direct bandgaps dependent on the number of atomic layers. We use high resolution scanning tunneling microscopy/spectroscopy (STM/STS) to study the atomic structure, intrinsic electronic properties, and grain boundaries of MoS₂ and WSe₂ layers on HOPG substrates. Using PTCDA as a prototype semiconductor organic molecule, we show that a monolayer TMD can effectively screen an organic-inorganic heterointerface. Other recent data on the molecule-TMD heterointerface will also be discussed.



Prof. Andrew T.S. Wee

Department of Physics, National University of Singapore

Professor Andrew Wee is a Professor of Physics, and Vice President (University and Global Relations) at the National University of Singapore (NUS). He holds a BA(Hons) & MA in Physics from the University of Cambridge, and a DPhil from the University of Oxford. He is President of the Singapore National Academy of Science (SNAS), Fellow of the Institute of Physics UK (IoP), Institute of Physics Singapore (IPS), and an academician of the Asia-Pacific Academy of Materials (APAM). His research interests include scanning tunneling microscopy (STM) and synchrotron radiation studies of the molecule-substrate interface, graphene and 2D materials. He has over 500 journal publications, is an Associate Editor of ACS Nano, and on the editorial boards of several other journals

Honors and Awards

Functionalised Nano-Material Science Award, International Conference on Novel Nanomaterial (ICON2), Beijing, China, 8-14 July 2016

Outstanding Scientist Award 2015, Faculty of Science NUS

Provost Chair Professor, NUS (1 July 2013 – 30 June 2016)

Institute of Physics Singapore (IPS) President's Medal 2008

FSNAS, (Fellow, Singapore National Academy of Science)

FInstP (Fellow, Institute of Physics, UK)

FIPS (Fellow, Institute of Physics Singapore)

Academician, Asia-Pacific Academy of Materials (APAM) (2013)

UK-Singapore Partners in Science Collaboration Award (2006),

Imperial College, UK

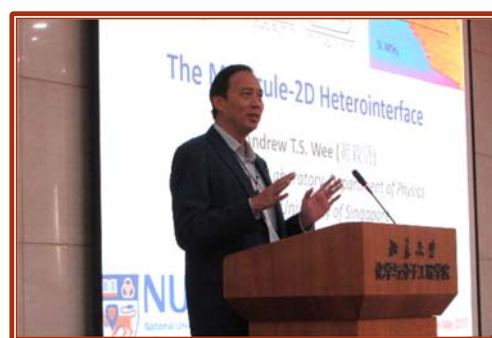
Visiting Scientist (2000), Lawrence Berkeley National Laboratories, US

Commonwealth Fellowship (1997), University of Oxford, UK

Rhodes Scholarship (1987), University of Oxford, UK

Singapore Government Scholarship (1984), University of London, UK

Overseas Merit Scholarship (1981), University of Cambridge, UK



聚合物宽谱光电探测器：材料与器件研究进展

Abstract

宽谱探测，即对紫外-可见-近红外光的探测，在科研、国防、环境监测、生物成像等领域具有广阔的应用前景而备受重视。商业化的硅探测器、铟镓砷探测器等均有其特定的探测响应波长范围，为实现宽谱探测，需要进行系统集成，大幅增加了难度和成本。另外，针对红外光的探测，为了获得较好的图像精度与质量，铟镓砷探测器必须在低温下工作，更增大了设备的复杂性与成本。共轭高分子具有结构与带隙可调和易加工等优势，无需通过器件集成，即可实现宽谱响应的光电探测。并且，共轭高分子半导体器件的暗电流受温度的影响小，在室温下即可实现对红外光的高敏探测，使聚合物光电探测器更具优势。但是，对聚合物光电探测材料与器件研究仍处初始阶段，科研人员正努力探寻获得高性能宽谱聚合物光电探测器的途径，着手解决材料结构与器件之间关系的基本科学问题。本报告将讲述该领域的研究进展以及我们的研究工作与结果。



Prof. Zhiyuang Wang (王植源)

中国科学院长春应用化学研究所 Changchun Institute of Applied Chemistry

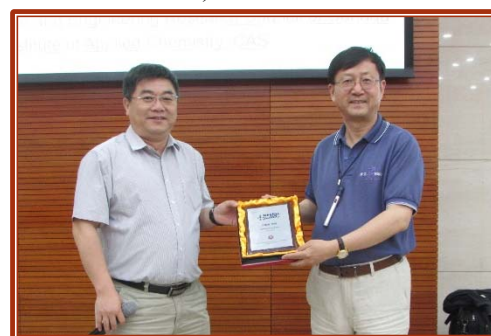
1982年毕业于北京大学化学系，1987年在加拿大麦吉尔（McGill）大学获有机化学博士学位。经过4年的博士后及公司工作之后，于1991年在加拿大卡尔顿大学化学系任教，1997年聘为终身教授，2001年聘任为加拿大新兴有机功能材料首席科学家。2007-2009年聘为北京大学长江讲座教授。2010年入选为“千人计划”国家特聘专家。

学术兼职包括加拿大化学会高分子科学与工程学会会长，Elsevier 高分子(英文)、高分子学报(英文)和中国高分子科学(英文)编辑咨询委员会成员，科学通报编辑部执行副主编，中国《应用化学》编委；曾担任加拿大国家自然与工程基金评审团专家，美国国家科学基金评审团专家，奥地利国家科学基金评审团专家及中科院海外评审专家(2003-2006)。

在 *J. Am. Chem. Soc.*、*Adv. Mater.*、*Adv. Funct. Mater.*、*Nano Lett.*、*Chem. Comm.* 等国际著名期刊上发表 SCI 收录论文 200 余篇，出版专著一本，获权美国和加拿大发明专利 14 项、中国发明专利 1 项。近年来主要研究兴趣涉及有机高分子红外功能材料和光电器件应用。

Honors and Awards

1995 年获中华人民共和国（国务院外专局）友谊奖；2003 年获“国家杰出青年 B 类基金奖”。1996，2000 及 2006 年三次获卡尔顿大学卓越研究奖；1999 和 2002 年两次获加拿大创新基金奖；2006 年获加拿大高分子科学与工程成就奖(Macromolecular Science and Engineering Award) (注：全加拿大高分子科学与工程学术界年度颁发唯一的最高奖)。2003 入选加拿大化学学院院士 (Fellow of the Chemical Institute of Canada)。



“Exhalomics” - Real-time Medical Diagnosis using Ambient Ionization Mass Spectrometry

Abstract

Exhaled breath contains relevant information on a person's health status. Our vision is to use real-time and completely non-invasive chemical analysis of exhaled breath for applications such as medical diagnosis, monitoring progress and treatment of diseases, drug compliance, pharmacokinetics, and others. The methodology we use to analyze breath in real time is based on secondary electrospray ionization coupled to high-resolution mass spectrometry (SESI-HRMS). It affords ppb-ppt limits of detection, and analysis of compounds with molecular weights up to 1000 Da.



Prof. Renato Zenobi

Department of Chemistry and Applied Biosciences, ETH Zürich, Switzerland

1986 M.S. ETH Zurich, Switzerland

1990 Ph.D., Stanford University, USA.

1990-1991, Postdoc, University of Pittsburgh and University of Michigan (1991).

1992, Werner Fellow at the EPFL, Lausanne, Switzerland.

1995, assistant professor, ETH

1997, associate professor, ETH Zurich, Switzerland.

2000-, full professor, ETH Zurich, Switzerland.

Selected Publications

Li, X.; Sinues, P. M.-L.; Dallmann, R.; *et al.* *Angew. Chem. Int. Ed.*, **2015**, *54*, 7815-7818.

Cubrilovic, D.; Barylyuk K.; Hofmann, D. *et al.*, *Chem. Sci.*, **2014**, *5*, 2794-2803.

Ibaneza, A. J.; Fagerer, S. R.; Schmidt, A. M. *et al.*, *Proc. Natl. Acad. Sci. U. S. A.*, **2013**, *110*, 8790-8794.

Honors and Awards

2017, ERC Advanced Grant, European Research Council

2014, Thomson Medal, International Mass Spectrometry Foundation

2010-, Associate Editor of Analytical Chemistry (American Chemical Society)



Physics seen through cylindrical molecules: An approach of a synthetic chemist



Prof. Hiroyuki Isobe

Department of Chemistry, The University of Tokyo

1994 B. S. in Chemistry (Tokyo Institute of Technology)

1996 M. S. in Chemistry (Tokyo Institute of Technology)

[1996 June-1996 August: Summer Student, Princeton University (Prof. D. Kahne)]

1998-2004: Assistant Professor, Department of Chemistry, The University of Tokyo

[1999 Ph. D. in Chemistry (The University of Tokyo)]

2004-2007: Associate Professor, Department of Chemistry, The University of Tokyo

2007-2016 Professor, Department of Chemistry, Tohoku University

2013-2016: Principal investigator, Advanced Institute for Materials Research (AIMR), Tohoku University

2013-Present: Research director, ERATO Isobe Degenerate π -Integration Project, JST

2016-Present: Professor, Department of Chemistry, The University of Tokyo

Honors and Awards

2000: The 1st IUPAC Prize for Young Chemists

2001: The 1st Young Scientists' Research Award in Natural Product Chemistry

2004: The 53rd Chemical Society of Japan Award for Young Chemists

2005: The 1st Osawa Award of Fullerene Nanotube Research Society

2007: Banyu Award in Synthetic Organic Chemistry, Japan

2008: Asian Core Program Lectureship Awards for 2009 (China and Singapore)

2008: The Young Scientists' Prize

(The Commendation for Science and Technology by the MEXT Minister)

2009: Nozoe Memorial Award for Young Organic Chemists

2010: Konica Minolta Award for Encouragement of Imaging Science

2015: Honorary International Chair Professor at National Taipei University of Technology

2016: The 33rd Chemical Society of Japan Award for Creative Work

2016: Emeritus Professor, Tohoku University

2017: The 33rd Inoue Prize for Science



Alzheimer's Amyloidogenic Peptides in Late and Early Disease Stages

Abstract

Aggregation of disordered amyloidogenic peptides into oligomers is the causative agent of amyloid-related diseases. In solution, disordered protein states are characterized by heterogeneous ensembles. Among these, β -rich conformers self-assemble via a conformational selection mechanism to form energetically-favored cross- β structures, regardless of their precise sequences. These disordered peptides can also penetrate the membrane, and electrophysiological data indicate that they form ion-conducting channels. We suggested that disordered amyloidogenic peptides can also present a common motif in the membrane. The motif is favored in the lipid bilayer since it permits hydrophobic side chains to face and interact with the membrane and the charged/polar residues to face the solvated channel pores. Such channels, which can be common at high $A\beta$ concentration in the late stage of Alzheimer's disease, are toxic since their pores allow uncontrolled leakage of ions into/out of the cell, destabilizing cellular ionic homeostasis. Alzheimer is a protein misfolding disease characterized by a build-up of $A\beta$ peptide as senile plaques, neurodegeneration, and memory loss. I will also present our work unveiling an unexpected structure of the most toxic Alzheimer $A\beta$ 1-42 species which may be present in the earlier stages of the disease. Finally, I will touch on our recent work on mechanisms of recognition of $A\beta$ monomer, oligomer, and fibril by homologous antibodies.

Prof. Ruth Nussinov

National Cancer Institute at Frederick, U.S.A.
Tel Aviv University, Israel



Ruth Nussinov is a computational structural biologist at the NCI. Her Ph D thesis proposed the dynamic programming algorithm for the prediction of RNA secondary structure, which is still the primary method toward this aim. She was among the pioneers of DNA sequence analysis, proposed the fundamental concept of Conformational Selection and Population shift, proposed that protein folding and protein binding are similar processes and that proteins whose sequence and global structures differ may still share similar interface architectural motifs. This concept serves as a basis for the prediction of protein interactions. She was also among the first to model amyloid conformations. Currently she focuses on signaling processes in cancer, particularly those Ras-driven. She received her Ph.D. in 1977 from Rutgers University and did post-doctoral work in the Structural Chemistry Department of the Weizmann Institute. Subsequently she was at the Chemistry Department at Berkeley, the Biochemistry Department at Harvard, and a visiting scientist at the NIH. In 1984 she joined the Department of Human Genetics, at the Medical School at Tel Aviv University. In 1985, she accepted a concurrent position at the National Cancer Institute of the NIH, Leidos Biomedical Research, where she is a Senior Principal Scientist and Principle Investigator heading the Computational Structural Biology Section at the NCI. She has authored over 550 scientific papers. She is the Editor-in-Chief in PLOS Computational Biology and Associate Editor and on the Editorial Boards of several journals. She is a frequent speaker in Domestic and International meetings, symposia and academic institutions, won several award and elected fellow of several societies.



Protein Evolution and Engineering to Enable Biotechnology, Genome Editing, and Novel Therapeutics

Abstract

In this lecture I will describe two efforts in our laboratory that integrate chemistry, evolution, and macromolecular engineering to address problems in biotechnology, genome editing, and therapeutics science.

To overcome the time- and labor-intensive nature of protein evolution in the laboratory, we developed phage-assisted continuous evolution (PACE), a method that enables proteins to evolve continuously in the laboratory. PACE accelerates protein evolution ~100-fold compared to stepwise protein-evolution methods. Our group used PACE to rapidly evolve a wide variety of proteins, including those with the potential to serve as novel therapeutic agents. We have also used PACE to study the reproducibility and path dependence of evolution over thousands of generations in a practical time frame. Recently, we used PACE to address a major problem threatening worldwide agricultural productivity: the rise of insects resistant to a widely used protein insecticide. We also applied PACE to evolve proteases with greatly altered protein cleavage specificities capable of cleaving proteins implicated in human disease.

In the second part of my lecture I will describe the development, application, and expansion of base editing, a new approach to genome editing that enables programmable correction of point mutations efficiently without requiring DNA backbone cleavage or donor DNA templates. Base editing has the potential to advance the scope and effectiveness of genome editing of point mutations, which represent the substantial majority of known human genetic variants associated with disease but are difficult to correct cleanly and efficiently using standard genome editing methods. Recent developments have enhanced the efficiency, product purity, targeting scope, precision, and conversion capabilities of base editing, increasing its potential to study and treat human genetic diseases.



Prof. David Liu

Department of Chemistry and Chemical Biology, Harvard University, HHMI

David R. Liu is Professor of Chemistry and Chemical Biology at Harvard University, Howard Hughes Medical Institute Investigator, and Core Institute Member and Vice-Chair of the Faculty of the Broad Institute of Harvard and MIT. Liu graduated first in his class at Harvard in 1994. He performed synthetic organic and bioorganic chemistry research on sterol biosynthesis under Professor E. J. Corey's guidance as an undergraduate. During his Ph.D. research with Professor Peter Schultz at U. C. Berkeley, Liu initiated the first general effort to expand the genetic code in living cells. He earned his Ph.D. in 1999 and became Assistant Professor of Chemistry and Chemical Biology at Harvard University in the same year. He was promoted to Associate Professor in 2003 and to Full Professor in 2005. Liu

became a Howard Hughes Medical Institute Investigator in 2005 and joined the JASONs, academic science advisors to the U.S. government, in 2009. Liu has earned several university-wide distinctions for teaching at Harvard, including the Joseph R. Levenson Memorial Teaching Prize, the Roslyn Abramson Award, and a Harvard College Professorship. He has published approximately 150 papers and 50 issued patents. His research accomplishments have earned distinctions including the Ronald Breslow Award for Biomimetic Chemistry, the American Chemical Society Pure Chemistry Award, the Arthur C. Cope Young Scholar Award, and awards from the Sloan Foundation, Beckman Foundation, NSF CAREER Program, and Searle Scholars Program. In 2016 he was named one of the Top 20 Translational Researchers in the world by Nature Biotechnology. Professor Liu's research integrates chemistry and evolution to illuminate biology and enable next-generation therapeutics. His major research interests include the engineering and delivery of genome-editing proteins to study and treat genetic diseases; the evolution of proteins with novel therapeutic potential using phage-assisted continuous evolution (PACE); and the discovery of bioactive synthetic small molecules and synthetic polymers through DNA-templated organic synthesis, an approach pioneered in his laboratory. He is the scientific founder or co-founder of several biotechnology and therapeutics companies including Ensemble Therapeutics, Permeon Biologics, Editas Medicine, Pairwise Plants, and Beam Therapeutics.



Clicking Polymers Together: Assembly of Complex, Controlled Polymer Structures from Efficient Chemistries

Abstract

A new paradigm, the Click Chemistry paradigm focusing on implementation of highly efficient reactions that achieve quantitative conversion under mild conditions, has been rapidly adopted in the fields of chemical synthesis, biotechnology, materials science, drug discovery, surface science, and polymer synthesis and modification. In particular, the synergistic combination of these click chemistries with photochemical initiation and polymer formation has been used to afford 4D control of polymer formation, structure and patterned assembly. Here, we will focus on three distinct vignettes related to our implementation of photoclickable polymer systems: (1) the development of covalent adaptable networks (CANs); (2) the development of approaches to photoinitiate the Cu(I) catalyzed azide-alkyne cycloaddition (CuAAC) click reaction; and (3) the development and implementation of click nucleic acids (CNAs) based on the thiol-ene click reaction.



Prof. Christopher N. Bowman

Department of Chemical and Biological Engineering, University of Colorado

1988 B.S., Chemical Engineering, Purdue University
 1991 Ph.D., Chemical Engineering, Purdue University
 1992-present Professor, Chemical and Biological Engineering, University of Colorado
 Web: <http://www.colorado.edu/bowmangroup/>

Selected Publications

1. McBride, M.K.; Hendrikx, M.; Liu, D.; Worrell, B.T.; Broer, D.J.; Bowman, C.N. *Adv. Mater.* **2017**, *29*, 1606509.
2. Lyon, G.B.; Cox, L.M.; Goodrich, J.T.; Baranek, A.D.; Ding, Y.; Bowman, C.N. *Macromolecules*, **2016**, *49*, 8905.

Honors and Awards

2015 Peyton-Skinner Award for Innovation in Dental Materials; 2011 American Institute of Chemical Engineers Professional Progress Award in Chemical Engineering; 2009 Stine Award, 2007 ACS PMSE Cooperative Research Award.



Amine-Modified Silicates as CO₂ Sorbents and Catalysts

Abstract

Worldwide energy demand is projected to grow strongly in the coming decades, with most of the growth in developing countries. Even with unprecedented growth rates in the development of renewable energy technologies such as solar, wind and bioenergy, the world will continue to rely on fossil fuels as a predominant energy source for at least the next several decades. The Intergovernmental Panel on Climate Change (IPCC) has stated that anthropogenic CO₂ has contributed measurably to climate change over the course of the last century. To this end, there is growing interest in new technologies that might allow continued use of fossil fuels without drastically increasing atmospheric CO₂ concentrations beyond currently projected levels. In this lecture, I will describe the design and synthesis, characterization and application of new aminosilica materials that we have developed as cornerstones of new technologies for the removal of CO₂ from dilute gas streams. These chemisorbents efficiently remove CO₂ from simulated flue gas streams, and the CO₂ capacities are actually enhanced by the presence of water, unlike in the case of physisorbents such as zeolites. Interestingly, the heat of adsorption for these sorbents is sufficiently high that the sorbents are also capable of capturing CO₂ from extremely dilute gas streams, such as the ambient air. Indeed, our oxide-supported amine adsorbents are quite efficient at the direct “air capture” of CO₂ and we will describe our investigations into development of “air capture” technologies as well. Finally, the amine-modified silica materials have also been used as efficient catalysts in coupling reactions important in organic synthesis, such as aldol and nitroaldol condensations. Inspired by biological catalysts that make and break bonds using cooperative organocatalytic sites, chemocatalysts designed to promote cooperativity between amines and hydrogen bonding sites are shown to be highly effective catalysts. Amine-modified silica materials present a versatile platform for diverse engineering applications.

Prof. Christopher W. Jones



School of Chemical & Biomolecular Engineering, Georgia Institute of Technology
Professor Jones is the Love Family Professor of Chemical & Biomolecular Engineering and the Associate Vice President for Research at Georgia Tech. Dr. Jones leads a research group that works in the broad areas of materials, catalysis and adsorption. Since joining Georgia Tech, Dr. Jones has been recognized with a number of awards for his research and teaching. The American Chemical Society recognized his catalysis research with the Ipatieff Prize in 2010, followed by the North American Catalysis Society with the Paul H. Emmett Award in Fundamental Catalysis in 2013. Dr. Jones is the founding Editor-in-Chief of the new journal, ACS Catalysis, which was recognized with the 2012 Prose Award as the Best New

Journal in Science, Technology or Medicine, by the American Association of Publishers. As Associate Vice-President for Research, Jones is responsible for leading and managing interdisciplinary research activities across six colleges, the Georgia Tech Research Institute, and the Enterprise Innovation Institute.

Honors and Awards

In 2016, he was recognized by the American Institute of Chemical Engineers for his work in catalysis and CO₂ capture with the Andreas Acrivos Award for Professional Progress.



Pincer-Metal Chemistry: Novel Opportunities for Catalysis and Materials

Abstract

From a historical perspective the birth of "pincer chemistry" will be sketched. The term "Pincer" refers to the unique combination of metal complex stability and well-defined coordination environment coupled with the ability of these prototypical monoanionic, terdentate aryl-Pincer ligands $[2,6-(ECH_2)_2C_6H_4]^-$, $E = R_2P, R_2N$ or RS , to act as catalyst in numerous different type of reactions. In this lecture an overview of our endeavours in Pincer-metal chemistry, which started in the early 1970s, will be presented focussing on the versatile binding modes of the Pincer-ligand to metal centres, and recent, novel applications of Pincer-metal complexes as sustainable, recyclable homogeneous catalysts in organic synthesis and as building blocks in materials science.



Prof. Gerard van Koten

Organic Chemistry and Catalysis, Debye Institute for Nanomaterials Science, Faculty of Science, Utrecht University, 3584 CG Utrecht, The Netherlands

1967-1976 Research group leader at the Institute for Applied and Scientific Research TNO, NL

1974 Ph. D., Organic Chemistry, Utrecht University, The Netherlands

1977-1986 Professor Inorganic Chemistry, University of Amsterdam

1986-2007 Chair of Organic Chemistry and Catalysis, Utrecht University

Current Honorary Professor of the Utrecht University and the University of Cardiff (UK)

Web: <https://www.uu.nl/staff/GvanKoten>

Selected Publications

[1] van Koten G et al. (1978) *J Organomet Chem* 148:233; (1978) *Chem Commun* 250.

[2] Albrecht M, van Koten G (2001) *Angew Chem Int Ed* 40:3750.

[3] van Koten G et al. (2013 and 2016) *Organometallic Pincer Chemistry*, *Top Organomet Chem*, Vol 40 and 54, respectively.

[4] Overviews: van Koten G (2013) *J Organometal Chem* 730:156 and (2017) 845: 4

Honors and Awards

2014 Honorary Member of the Dutch Catalysis Society

2008 President of the Royal Dutch Chemical Society (KNCV)

2003 Dean of the Faculty of Science, Utrecht University

2002 Member of the Royal Netherlands Academy of Arts and Sciences (KNAW)

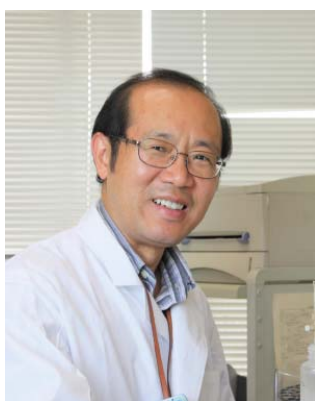
1989 the Gold medal for Chemistry from the RSC of The Netherlands



环境放射性核素质谱超痕量分析研究进展

Abstract

The Fukushima Daiichi Nuclear Power Plant accident renewed considerable public concern about the dangers posed by radioactive contamination in the environment and the related internal exposure from the contaminating radionuclides. Sensitive and accurate analysis of radiation sources, and the amount and range of radioactive contamination is essential for effective radiation protection. Therefore, we have developed advanced mass spectrometric techniques for sensitive determination of hard-to-detected radionuclides. The talk will give an overview about the latest developments in this area and the application of radionuclides as geochemical tracer for radioactive source identification and long-term environmental behavior studies in environmental radiochemistry.



Dr. Jian Zheng

Senior Principal Researcher

Fukushima Project Headquarters, National Institute of Radiological Sciences, National Institutes for Quantum and Radiological Science and Technology, Japan

1987 B. Sc. Fudan University, Shanghai, P.R. China

1990 M. Sc. The Chinese Academy of Sciences, Shanghai, P.R. China

1998 Ph. D. Institute for Analytical Chemistry, Karl-Franzens University Graz, Austria

2003-2008 Researcher-Senior Researcher at National Institute of Radiological Sciences, Japan

2016 Principal Researcher at National Institute of Radiological Sciences, Japan

2017 Senior Principal Researcher at National Institute of Radiological Sciences, Japan

Web: https://www.researchgate.net/profile/Jian_Zheng6

Selected Publications

1. Wang, Z.; Zheng, J.; Ni, Y.; Men, W.; Tagami, K.; Uchida, K. *Anal. Chem.* **2017**, *89*, 2221.
2. Zheng, J.; Cao, L.; Tagami, K.; Uchida, S. *Anal. Chem.* **2016**, *88*, 8772.
3. Wang, Z.; Zheng, J.; Cao, L.; Tagami, K.; Uchida, K. *Anal. Chem.* **2016**, *88*, 7387.
4. Zheng, J.; Bu, W.; Tagami, K.; Shikamori, K.; Nakano, S.; Uchida, S.; Ishii, N. *Anal. Chem.* **2014**, *86*, 7103.

Honors and Awards

1996 North-South Dialogue Research Fellow; 2001 JST Research Fellow; 2009 Outstanding Research Award of the National Institute of Radiological Sciences, Japan; 2015 Society Award of the Japan Society of Nuclear and Radiochemical Sciences; 2015 Editor of “Journal of Nuclear and Radiochemical Sciences”; 2017 Editor of “Scientific Reports”. 2016 Outstanding Reviewer of Elsevier.



Fluorescence of Single-Walled Carbon Nanotubes: From Discovery to Applications

Abstract

Single-walled carbon nanotubes (SWCNTs) are a family of artificial nanostructures with unique physical and chemical properties that have inspired extensive basic and applied research. Most structures of SWCNTs are semiconducting and show direct band gap photoluminescence (fluorescence) at characteristic wavelengths in the short-wave infrared. Each structural form of SWCNT displays a characteristic spectral signature that provides a powerful basis for qualitative identification and quantitative analysis. Fluorescence from SWCNTs is also very robust, allowing steady emission during long periods of intense irradiation. This enables individual SWCNTs to be imaged and studied in a variety of environments, including liquid suspensions, polymeric hosts, and biological tissues. The discovery and spectral assignment of SWCNT short-wave infrared fluorescence will be described. Examples will then be presented showing how this effect has led to improved sample characterization, studies of fundamental photophysical properties, and new applications in biomedicine and engineering.



Prof. R. Bruce Weisman

Chemistry and of Materials Science and NanoEngineering at Rice University

Dr. Weisman received his B.A. from Johns Hopkins University and his Ph.D. in chemistry from the University of Chicago. He did postdoctoral research at the University of Pennsylvania before joining the Rice faculty in 1979

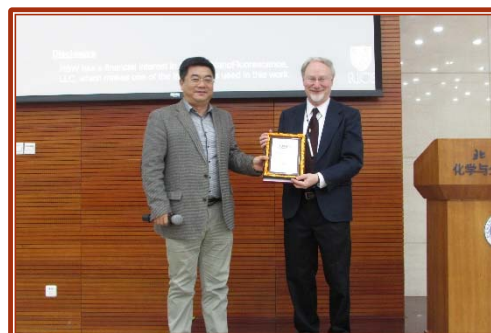
Web: <http://chemistry.rice.edu/FacultyDetail.aspx?RiceID=597>

Selected Publications

1. "Biexciton, Single Carrier, and Trion Generation Dynamics in Single-Walled Carbon Nanotubes," B. Yuma, S. Berciaud, J. Besbas, J. Shaver, S. Santos, S. Ghosh, R.B. Weisman, L. Cognet, M. Gallart, M. Ziegler, B. Hönerlage, B. Lounis, and P. Gilliot, *Phys. Rev. B* 87, 205412, **2013**.
2. "Carbon Nanotubes as Non-Contact Optical Strain Sensors in Smart Skins," Peng Sun, Sergei M. Bachilo, R. Bruce Weisman, and Satish Nagarajaiah, *J. Strain Analysis for Engineering Design* 50, 505-512, **2015**.

Honors and Awards

Dr. Weisman has held fellowships from the National Science Foundation, the Hertz Foundation, and the Alfred P. Sloan Foundation. Prof. Weisman's current research involves basic and applied studies of carbon nanotubes. He is Treasurer and immediate past Chair of the Nanocarbons Division of The Electrochemical Society. Dr. Weisman is also the founder and president of Applied NanoFluorescence, LLC. He is a former Co-Editor of the journal Applied Physics A and is an elected Fellow of the American Physical Society, The Electrochemical Society, and the American Association for the Advancement of Science.



Kinetic and Spectroscopic Studies of Catalytic Mechanisms: Hydrodeoxygenation of Biomass Feedstocks on Transition Metal Phosphides

Abstract

The study of mechanisms of reaction is an active area of chemical kinetics, even though it is generally held that mechanisms cannot be proven on the basis of kinetics alone. This work shows that reactivity, spectroscopic, and transient data can be combined to give a unified picture of a reaction mechanism. The reaction studied is the hydrodeoxygenation of a pyrolysis liquid model compound, gamma-valerolactone (GVL). Use is made of in situ Fourier transform infrared spectroscopy and in situ x-ray absorption spectroscopy to probe adsorbed species and the nature of the catalyst surface at reaction conditions. A new method, called Analysis of Coverage Transients (ACT) is used to prove that an adsorbed species is an actual reaction intermediate. The ACT method is general and can be used with any spectroscopic technique.

The application of the work is in the conversion of pyrolysis liquids derived from biomass, whose high oxygen content (~40 wt.%) results in low heating value (about half that of petroleum liquids), high acid content (leading to corrosion problems), and low stability (resulting in increasing viscosity with storage). The catalyst studied is a member of a new family of catalysts, the transition metal phosphides, which have outstanding activity for removal of heteroatoms such as sulfur, nitrogen, and oxygen, from hydrocarbon feedstreams.

A contact time study allowed the determination of a reaction sequence for GVL HDO on Ni₂P/SiO₂ and it was found that C-O bond cleavage of the lactone ring to generate n-pentanoic acid was the rate-determining step. This was followed by hydrogen transfer steps to produce oxygen free compounds, n-pentane or n-butane. Fitting of the results using a rake mechanism that considers adsorbed intermediates indicates that the surface species from the adsorbed GVL are majority species. In situ x-ray absorption near-edge spectroscopy measurements using the ACT method give strong evidence to support this reaction mechanism.



Prof. S. Ted Oyama

Department of Chemical Systems Engineering, The University of Tokyo
 Departments of Chemical Engineering, Virginia Polytechnic Institute and State University (Virginia Tech)

1976.05 B.S., Yale University, New Haven, Connecticut, USA
 1981.05 PhD, Stanford Univ., Stanford, California, USA
 1981.06 Research Engineer/Project Leader, Catalytica, Inc., USA
 1987.06 Associate Professor, Clarkson Univ., Potsdam, New York, USA
 1992.06 Professor, Virginia Tech, Blacksburg, Virginia, USA
 2009.11 Professor, The University of Tokyo, Tokyo, Japan

Honors and Awards

Prof. S. Ted Oyama is a recipient a 2009 Humboldt Senior Researcher Prize, 2012 Fellow of the American Chemical Society (ACS), the 2014 ACS Distinguished Researcher Award, the 2014 ACS Storch Award, and 2016 Fellow of the American Association for the Advancement of Science.



Functional Polymer Materials Designed for Advanced Applications and Sustainability

Abstract

With advances in the translation of nanoscience to nanotechnology comes a need to consider sustainable sourcing of the building blocks used to create the nanotechnological devices at the same time that the functional performance application is defined. This presentation will highlight contributions that polymer chemistry can make toward nanotechnology that is capable of impacting global needs, such as water-food-energy-health, and the grand challenges that must be solved in the coming decade. The focus will include an integration of current approaches to construct nanoscopic systems from natural products with the design of hybrid nanoscopic systems that are capable of pollutant sequestration and magnetic recovery toward environmental remediation, or for drug delivery with selective therapeutic outcomes, among other applications.



Prof. Karen L. Wooley

Department of Chemistry, Texas A&M University

1988 B. S., Oregon State University, Chemistry,

1993 Ph. D., Cornell University, Polymer/Organic Chemistry

1993-1999 Assistant Professor, Department of Chemistry, Washington University

1999-2009 Professor, School of Arts & Sciences, Department of Chemistry, Washington University

2007-2009 Professor, School of Medicine, Department of Radiology, Washington University

2009-present W. T. Doherty-Welch Chair in Chemistry; Professor of Chemistry; Professor of Chemical Engineering, Texas A&M University

2014-present Professor, Materials Science & Engineering, Texas A&M University

Honors and Awards

2016, Distinguished Research Achievement Award, Texas A&M University Association of Former Students; 2015-present, American Academy of Arts & Sciences Fellow; 2011-present, Texas A&M University Distinguished Professor; 2015, Oesper Award, University of Cincinnati Department of Chemistry; 2014-present, Honorary Fellow of the Chinese Chemical Society; 2014-present, Fellow of the Royal Society of Chemistry; 2014, Royal Society of Chemistry Centenary Prize; 2014, Texas A&M System Technology Commercialization Innovation Award; 2014-present, Associate Editor, J. Am. Chem. Soc; 2014, American Chemical Society Award in Polymer Chemistry; 2009, American Chemical Society, Polymer Chemistry Division, Herman F. Mark Scholar Award; 2002, Arthur C. Cope Scholar Award in Organic Chemistry.



Hunting for the Hidden Chemistry in Solid Catalysts: Towards a Molecular Movie

Abstract

The search for new or more effective solid catalysts would benefit when we could bridge the molecular world with the macroscopic world. Such detailed information can be realized if we would have access to a very powerful camera shooting molecular movies of an active catalytic solid at a submolecular level. This is the field of operando spectroscopy and recent breakthroughs in chemical imaging techniques, based on optical, electron and X-ray methods, demonstrate that such molecular movie concept is within reach. This lecture discusses the recent advances in spectroscopy and microscopy of catalytic solids at different length scales, starting from single molecules and single atoms up to the level of individual catalyst particles. Special emphasis will be devoted to the exploration of mesoscale effects in catalytic solids as well as on the scientific challenges ahead to make such molecular movie reality.



Prof. Bert Weckhuysen

Inorganic Chemistry and Catalysis group, Debye Institute for Nanomaterials Science, Utrecht University

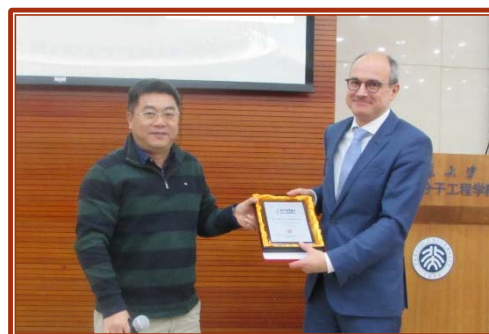
1995 Ph. D with honors (highest degree), Leuven University,
1997-2000 Research fellow, Belgian National Science Foundation,
2000- Full Professor, Utrecht University
2012- Distinguished Professor of the Faculty of Science, Utrecht University
Web: <http://www.inorganic-chemistry-and-catalysis.eu>

Selected Publications

1. D. E. Perea, I. Arslan, J. Liu, Z. Ristanović, L. Kovarik, B. W. Arey, J. A. Lercher, S. R. Bare, B. M. Weckhuysen, *Nature Communications* **2015**, 6, 7589.
2. Y. Liu, F. Meirer, C. M. Krest, S. Webb, B. M. Weckhuysen, *Nature Communications* **2016**, 7, 12634.
3. I. L. C. Buurmans, B. M. Weckhuysen, *Nature Chemistry* **2012**, 44, 873.

Honors and Awards

Prestigious VICI (2002), TOP (2006 and 2011) and Gravitation (2013) grants from the Netherlands Organization for Scientific Research (NWO). 2006 Royal Dutch Chemical Society Gold Medal, 2009 Netherlands Catalysis and Chemistry Award, 2011 Paul H. Emmett Award in Fundamental Catalysis of the North American Catalysis Society, International Catalysis Award 2012 of the International Association of Catalysis Societies. In 2015 he has been appointed Knight in the Order of the Netherlands Lion.



Enzymatic bioelectrocatalysis: From metabolic pathways to metabolons

Abstract

Oxidoreductase enzymes have been employed for almost 5 decades in biosensors and for energy conversion in the form of biofuel cells. However, most enzymatic bioelectrodes in the literature utilize complex biofuels (e.g. glucose), but only partially oxidize the complex biofuel via the use of a single enzyme (i.e. glucose oxidase or glucose dehydrogenase). This presentation will detail the use of enzyme cascades at bioanodes for deep to complete oxidation of substrates to improve performance (current density and power density), but will focus on the importance of forming metabolons for substrate channeling in multi-enzyme cascades. These enzyme cascades will include natural metabolons (i.e. the Krebs cycle) and artificial metabolons utilizing DNA and peptides as scaffolds. It will discuss the importance of structural orientation of enzymes and enzyme complexation in enzymatic cascades for efficient bioelectrocatalysis.



Prof. Shelley Minter

Departments of Chemistry, The University of Utah, USA

1995 B.S. in Chemistry, Western Illinois University,

2000 Ph.D. in Chemistry, University of Iowa,

2000-2011 Assistant, Associate and full Professor of Chemistry at Saint Louis University

2011- USTAR Professor in both the Departments of Chemistry and Materials Science and Engineering at the University of Utah

Selected Publications

1. R.D. Milton, R. Cai, S. Sahin, S. Abdellaoui, B. Alkotaini, D. Leech, and S.D. Minter, *JACS*, **2017**, 139, 9044-9052..
2. J. Kitt, D. Bryce, S.D. Minter, and J.M. Harris, *JACS*, **2017**, 139, 3851-3860.
3. R.D. Milton, R. Cai, S. Abdellaoui, D. Leech, A.L. De Lacey, M. Pita, and S.D. Minter, *Angew. Chem. Int. Ed.* **2017**, 56, 2680-2683.

Honors and Awards

She is now an Associate Editor for the Journal of the American Chemical Society. She has published greater than 250 publications and greater than 350 presentations at national and international conferences and Universities. She has won several awards including the Luigi Galvani Prize of the Bioelectrochemical Society, the Missouri Inventor of the Year, International Society of Electrochemistry Tajima Prize, Fellow of the Electrochemical Society, and the Society of Electroanalytical Chemists' Young Investigator Award.



Recent Advances in Carbene Chemistry: Concepts and Applications

Abstract

This lecture intends to showcase some unconventional ways of harnessing the reactivity of alkynes via highly selective metal-catalyzed transformations. After a short review of our work in the area of triple bond metathesis, some unorthodox addition reactions to internal alkynes will be discussed in detail.

The use of carbophilic Lewis acids based on gold, platinum or rhodium provides many opportunities for the selective functionalization of triple bonds. Although it is well accepted that the reactions usually proceed via metal carbene intermediates, the actual nature of such species was subject to speculation. Only recently has our group managed to isolate reactive carbenes of gold and rhodium. The structural features of these species and the preparative implications will be discussed in some detail.

Moreover, unprecedented ruthenium-catalyzed trans-hydrogenation, trans-hydroboration and trans-hydrostannation reactions will be presented. These unconventional transformations are also thought to proceed via metal-carbene intermediates, some of which have also been isolated and fully characterized. Selected applications to target-oriented synthesis are meant to showcase the current state of development.



Prof. Alois Fürstner

Max-Planck-Institut für Kohlenforschung, Germany

2009-2011 Managing Director of the Max-Planck-Institut für Kohlenforschung

since 1998 Director at the Max-Planck-Institut für Kohlenforschung and Professor at the Technical University of Dortmund

1993-1998 Group leader at the Max-Planck-Institut für Kohlenforschung and Lecturer at the University of Dortmund

1992 "Habilitation" in Organic Chemistry at the Technical University Graz, Austria

1990-1991 Postdoctoral fellow at the University of Geneva, Switzerland (W. Oppolzer)

1987 PhD at the Technical University Graz, Austria (H. Weidmann)

Honors and Awards

2016 Herbert C. Brown Award for Creative Research in Synthetic Methods

2015 Adolf Windaus Medal, Göttingen

2014 Thomson Reuters Highly Cited Researcher

2014 Gay-Lussac-Humboldt Prize

2014 Hans Herloff Inhoffen Medal

2013 Kitasato Medal, Tokyo, Japan

2013 Karl Ziegler Prize of the German Chemical Society

2013 Prix Jaubert of the University of Geneva

2011 Prelog Medal, ETH Zurich, Switzerland

2011 Lilly European Distinguished Lectureship Award

2008 Janssen Pharmaceutica Prize for Creativity in Organic Synthesis

2006 Heinrich Wieland Prize

2006 Otto Bayer Prize

