The 1st New Energy Workshop

第一届吉林大学-UC Berkeley新能源研讨会
暨新能源国际联合实验室成立

Friday 28 June 2013, Jilin University, Changchun, China

吉林大学无机合成与制备化学国家重点实验室
State Key Laboratory of Inorganic Synthesis and Preparative Chemistry

Jilin University

The College of Chemistry at Jilin University is one of the leading chemistry education and research centers in China. According to ESI, the College of Chemistry at Jilin University is among the world's top 1% institutions in chemistry. Its precedent, the Department of Chemistry, was founded in 1952 as a result of the nation-wide college and department adjustment. Now, the College of Chemistry has 340 faculty and staff members. It offers both undergraduate and graduate programs with more than 1,000 undergraduate students and 1,000 graduate students.

The College of Chemistry is comprised of 6 departments, 4 research centers, and 3 state key laboratories. Under the support of the national "985 Project" and "211 Project", the research facility has been greatly improved in the past few years. The instruments and experimental facilities are valued more than 200 million RMB Yuan. In the past 5 years, the College of Chemistry has won financial support of more than 450 million RMB Yuan. The College of Chemistry publishes about 1,000 scientific papers every year, many of which are published at the leading scientific journals, such as *Nature, Science, Chem. Rev., Chem. Soc. Rev., Acc. Chem. Res., Angew. Chem. Int. Ed., J. Am. Chem. Soc., and Chem. Sci., etc*.

Tang Ao Qing Building
(name after Professor Tang Aoqing, one of the leaders of the college of chemistry)

State Key Laboratory of Inorganic Synthesis and Preparative Chemistry/ State Key Laboratory of Supramolecular Structure and Materials

International Joint Research Laboratory of New Energy
新能源国际联合实验室

The combustion of current energy source including coal, oil and natural gas results the sharply rising of atmospheric carbon dioxide and great environmental concerns. Moreover, consumption is expected to increase over the next 50 years, driven by higher demands in developing nations. Therefore, the issues of energy sourcing, including fuel use, climate change, and sustainable energy generation have been paid great attentions by the scientists all over the world.

UC Berkeley is one of the best university in the world and has high academic reputation worldwide. The chemistry program in UC Berkeley ranked the top three in the 2010 National Research Council Rankings. The College of Chemistry of Jilin University and UC Berkeley have established long-term cooperation relationship. Professor Jeffrey R. Long, Professor Peidong Yang and Professor Christopher J. Chang have visited Jilin University many times. Professor Peidong Yang, Professor Jeffrey R. Long and Professor Omar M. Yaghi have been employed as emeritus professors of Jilin University. Professor Jeffrey R. Long and Professor Guangshan Zhu have been cooperating in a major international cooperation project funded by NSFC.

Facing up to the issues of the potential new energy sources, the researchers from UC Berkeley and Jilin University decided to found the International Joint Research Laboratory of New Energy. The laboratory will be led by famous professors from both universities and form a research team with several excellent researchers introduced overseas. The research of this laboratory will focus on the challenges in the realization of new energies, such as hydrogen storage, carbon dioxide capture and separation, solar cell, and energy conversion.

Workshop Program

Place: the Lecture Hall of the State Key Laboratory of Inorganic Synthesis and Preparative Chemistry, Jilin University, Changchun, China.

Date: Friday, 28th June, 2013.

Time	Event	
9:30	Ji Zhao, *Vice-President of Jilin University* Welcome, Inauguration and Photo	Chair: Guangsheng Pang *Vice-President of College of Chemistry*
10:10	Jeffrey R. Long, *Professor of University of California, Berkeley* Carbon Dioxide Capture and Hydrocarbon Separations in Metal-Organic Frameworks	Chair: Yan Xu *Professor of Jilin University*
10:45	Jihong Yu, *Professor of Jilin University* Towards Designed Synthesis of Zeolitic Porous Materials	
11:20	Christopher J. Chang, *Professor of University of California, Berkeley* Molecular Approaches to Catalytic Production of Hydrogen from Water	
11:55	Lunch	
13:50	Haw Yang, *Associate Professor of Princeton University* Towards Single-Molecule Activity in Living Cells	Chair: Jihong Yu *Professor of Jilin University*
14:25	Coffee break	
14:40	Hao Zhang, *Professor of Jilin University* Nanocrystal/Polymer Composites with Supramolecular Structures	
15:15	Peidong Yang, *Professor of University of California, Berkeley* Semiconductor Nanowires for Artificial Photosynthesis	
15:50	Communication	
16:30	Remarks and Close	

Speaker Biographies

Jeffrey R. Long

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Homepage: *http://alchemy.cchem.berkeley.edu*

EXPERIENCE

2009 - present	Faculty Senior Scientist, Materials Sciences Division, Lawrence Berkeley National Laboratory
2007 - present	Professor of Chemistry, University of California, Berkeley
2003 - 2009	Faculty Scientist, Materials Sciences Division, Lawrence Berkeley National Laboratory
2003 - 2007	Associate Professor and Vice Chair of Chemistry, University of California, Berkeley
1997 - 2003	Assistant Professor of Chemistry, University of California, Berkeley
1996 - 1997	Postdoctoral Fellow, University of California, Berkeley
1995 - 1996	Postdoctoral Fellow, Harvard University
1995	Ph.D. in Chemistry, Harvard University
1991	B.A. in Chemistry and Mathematics, Cornell University

CURRENT RESEARCH ACTIVITIES

Inorganic and Solid State Chemistry: synthesis of inorganic clusters and solids; electronic and magnetic properties of inorganic materials; single-molecule magnets; metal-organic frameworks; hydrogen storage; carbon dioxide capture; water splitting catalysts; actinide-containing clusters; electron transport through molecular inorganic clusters; prion-polyoxometalate interactions.

SELECTED HONORS AND AWARDS

- Miller Research Professorship (UC Berkeley, 2011);
- National Fresenius Award (Phi Lambda Upsilon, 2004);
- National Science Foundation Special Creativity Award (2003-2005 and 2009-2011);

- TR100 Award (2002);
- Alfred P. Sloan Research Fellowship (2001-2003);
- Camille Dreyfus Teacher-Scholar Award (2000);
- Research Corporation Research Innovation Award (1998).

SELECTED PUBLICATIONS

1. "Separation of Hexane Isomers in a Metal-Organic Framework with Triangular Channels" Herm, Z. R.; Wiers, B. M.; Mason, J. A.; van Baten, J. M.; Hudson, M. R.; Zajdel, P.; Brown, C. M.; Masciocchi, N.; Krishna, R.; Long, J. R. *Science* 2013, *340*, 960-964.
2. "Magnetic Blocking in a Linear Iron(I) Complex" Zadrozny, J. M.; Xiao, D. J.; Atanasov, M.; Long, G. J.; Grandjean, F.; Neese, F.; Long, J. R. *Nat. Chem.* 2013, *5*, 577-581.
3. "Impact of Metal and Anion Substitutions on the Hydrogen Storage Properties of M-BTT Metal-Organic Frameworks" Sumida, K.; Stück, D.; Mino, L.; Chai, J.-D.; Bloch, E. D.; Zavorotynska, O.; Murray, L. J.; Dincă, M.; Chavan, S.; Bordiga, S.; Head-Gordon, M.; Long, J. R. *J. Am. Chem. Soc.* 2013, *135*, 1083-1091.
4. "Exchange Coupling and Magnetic Blocking in Bipyrimidyl Radical-Bridged Dilanthanide Complexes" Demir, S.; Zadrozny, J. M.; Nippe, M.; Long, J. R. *J. Am. Chem. Soc.* 2012, *134*, 18546-18549.
5. "Capture of Carbon Dioxide from Air and Flue Gas in the Alkylamine-Appended Metal-Organic Framework mmen-Mg_2(dobpdc)" McDonald, T. M.; Lee, W. R.; Mason, J. A.; Wiers, B. M.; Hong, C. S.; Long, J. R. *J. Am. Chem. Soc.* 2012, *134*, 7056-7065.
6. "Hydrocarbon Separations in a Metal-Organic Framework with Open Iron(II) Coordination Sites" Bloch, E. D.; Queen, W. L.; Krishna, R.; Zadrozny, J. M.; Brown, C. M.; Long, J. R. *Science* 2012, *335*, 1606-1610.
7. "A Molecular MoS_2 Edge Site Mimic for Catalytic Hydrogen Generation" Karunadasa, H. I.; Montalvo, E.; Sun, Y.; Majda, M.; Long, J. R.; Chang, C. J. *Science* 2012, *335*, 698-702.
8. "Selective Binding of O_2 over N_2 in a Redox-Active Metal-Organic Framework with Open Iron(II) Coordination Sites" Bloch, E. D.; Murray, L. J.; Queen, W. L.; Maximoff, S. N.; Chavan, S.; Bigi, J. P.; Krishna, R.; Peterson, V. K.; Grandjean, F.; Long, G. J.; Smit, B.; Bordiga, S.; Brown, C. M.; Long, J. R. *J. Am. Chem. Soc.* 2011, *133*, 14814-14822.

9. "Strong Exchange and Magnetic Blocking in N_2^{3-} Radical-Bridged Lanthanide Complexes" Rinehart, J. D.; Fang, M.; Evans, W.; Long, J. R. *Nat. Chem.* **2011**, *3*, 538-542.
10. "A Molecular Molybdenum-Oxo Catalyst for Generating Hydrogen from Water" Karunadasa, H. I.; Chang, C. J.; Long, J. R. *Nature* **2010**, *464*, 1329-1333.

Jihong Yu

State Key Laboratory of Inorganic Synthesis and Preparative Chemistry, Jilin University, Changchun, China
E-mail: jihong@jlu.edu.cn

EXPERIENCE

2011-2015	Chief Scientist of the 973 Project of China
2007-2010	Cheung Kung Professorship, Ministry of Education of China
2004.5-2004.8	Guest Professor, Department of Chemistry, Stockholm University, Sweden
1999-present	Professor, Department of Chemistry, Jilin University, Changchun, China
1997-1999	Associate Professor, Department of Chemistry, Jilin University, Changchun, China
1995-1997	Assistant Professor, Department of Chemistry, Jilin University, Changchun, China
1997-1998	Foreign Researcher, Physics Department, Tohoku University, Sendai, Japan CREST
1996-1997	Postdoctoral Fellow, Department of Chemistry, The Hongkong University of Science and Technology
1985-1995	BS/MS/PhD, Department of Chemistry, Jilin University, Changchun, China

CURRENT RESEARCH ACTIVITIES

Her research interest is in the designed synthesis of zeolitic porous functional materials.

HONORS AND AWARDS

2012 National Prize for Natural Science (II)

2010 The Bau Family Award in Inorganic Chemistry

2009 The 6th Chinese Youth Woman Scientist

2008 National Natural Science Award (I) of Jilin Province

2007 National Prize for Natural Science (II)

2007 The 10th China Youth Science and Technology Award

2001 National Outstanding Youth Science Foundation of China

2000 The Teaching and Research Award Program for Outstanding Young Teachers in Higher Education Institutions of MOE, China

PUBLICATIONS

1. "Criteria for Zeolite Frameworks Realizable for Target Synthesis", Li Y, Yu JH, Xu RR, *Angew. Chem. Int. Ed.,* 2013, 52, 1673.
2. "A Gallogermanate Zeolite with Eleven-Membered-Ring Channels", Xu Y, Li Y, Han YD, Song XW, Yu JH, *Angew. Chem. Int. Ed.,* 2013, 52, 5501.
3. "Needs and Trends in Rational Synthesis of Zeolitic Materials", Wang ZP, Yu JH, Xu RR, *Chem. Soc. Rev.,* 2012, 41, 1729.
4. "Zeolite-Coated Mesh Film for Efficient Oil–Water Separation", Wen Q, Di JC, Jiang L, Yu JH, Xu RR, *Chem. Sci.* 2013, 4, 591.
5. "A Gallogermanate Zeolite Constructed Exclusively by Three-Ring Building Units", Han YD, Li Y, Yu JH, Xu RR, *Angew. Chem. Int. Ed.,* 2011, 50, 3003.
6. "Synthesis and Structure Determination of the Hierarchical Meso-Microporous Zeolite ITQ-43", Jiang JX, Jorda JL, Yu JH, Baumes LA, Mugnaioli E, Diaz-Cabanas MJ, Kolb U, Corma A, *Science*, 2011, 333, 1131
7. "Ionothermal Synthesis of Extra-Large-Pore Open-Framework Nickel Phosphite $5H_3O\cdot[Ni_8(HPO_3)_9Cl_3]\cdot1.5H_2O$: Magnetic Anisotropy of the Antiferromagnetism", Xing HZ, Yang WT, Su T, Li Y, Xu J, Nakano T, Yu JH, Xu RR, *Angew. Chem. Int. Ed.,* 2010, 49, 2328.
8. "Rational Approaches toward the Design and Synthesis of Zeolitic Inorganic Open-Framework Materials", Yu JH, Xu RR, *Acc. Chem. Res.,* 2010, 43, 1195.
9. "A Crystalline Germanate with Mesoporous 30-Ring Channels", Ren XY, Li Y, Pan QH, Yu JH, Xu RR, Xu Y, *J. Am. Chem. Soc.,* 2009, 131, 14128.
10. "Heteroatom-Stabilized Chiral Framework of Aluminophosphate Molecular Sieves", Song XW, Li Y, Gan L, Wang ZP, Yu JH, Xu RR, *Angew. Chem. Int. Ed.,* 2009, 48, 314.

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EXPERIENCE

2012 – present	Professor, Departments of Chemistry and Molecular and Cell Biology, University of California, Berkeley
2009 – 2012	Associate Professor, Department of Chemistry, University of California, Berkeley
2004 – 2009	Assistant Professor, Department of Chemistry, University of California, Berkeley
2008 – present	Adjunct Professor, Department of Pharmaceutical Chemistry, University of California, San Francisco
2008 – present	Investigator, Howard Hughes Medical Institute, University of California, Berkeley
2004 – present	Faculty Scientist, Chemical Sciences Division, Lawrence Berkeley National Laboratory
2002 – 2004	Jane Coffin Childs Postdoctoral Fellow, Massachusetts Institute of Technology
2002	Ph.D., Inorganic Chemistry, Department of Chemistry, Massachusetts Institute of Technology
1998	Fulbright Scholar, Universite Louis Pasteur
1997	B.S./M.S., Chemistry, Department of Chemistry, California Institute of Technology

CURRENT RESEARCH ACTIVITIES

Our laboratory works in two frontier areas of chemistry of fundamental interest and broader societal impact: brain chemistry and sustainable energy chemistry.

HONORS AND AWARDS

2004 Dreyfus New Faculty Award

2005 American Federation for Aging Resesearch Award; Beckman Young Investigator

2006 NSF CAREER Award; Packard Fellowship

2007 Alfred P. Sloan Fellowship; ACS Organic Young Investigator

2008 Paul Saltman Award, Metals in Biology Gordon Research Conference; Amgen Young Investigator Award; Hellman Faculty Award; Bau Award in Inorganic Chemistry; Technology Review TR35 Young Innovator; Howard Hughes Medical Institute Investigator

2009 Astra Zeneca Excellence in Chemistry Award; Novartis Early Career Award

2010 ACS Cope Scholar Award

2011 Society for Biological Inorganic Chemistry Early Career Award; Miller Institute Research Professor(-2012); Wilson Prize, Harvard University(-2012)

2012 ACS Eli Lilly Award in Biological Chemistry; RSC Chemistry of Transition Metals Award

2013 ACS Nobel Laureate Signature Award in Graduate Education; Noyce Prize for Excellence in Undergraduate Teaching

SELECTED PUBLICATIONS

1. “A Selective, Cell-Permeable Optical Probe for Hydrogen Peroxide in Living Cells”, Chang, M. C. Y.; Pralle, A.; Isacoff, E. Y.; Chang, C. J. *J. Am. Chem. Soc.* **2004**, *126*, 15292-15293.
2. “A Selective Turn-On Fluorescent Sensor for Imaging Copper in Living Cells”, Zeng, L.; Miller, E. W.; Pralle, A.; Isacoff, E. Y.; Chang, C. J. *J. Am. Chem. Soc.* **2006**, *128*, 10-11.
3. “Molecular Imaging of Hydrogen Peroxide Produced for Cell Signaling”, Miller, E. W.; Tulyathan, O.; Isacoff, E. Y.; Chang, C. J. *Nature Chem. Biol.* **2007**, *3*, 263-267.
4. “Aquaporin-3 Mediates Hydrogen Peroxide Uptake to Regulate Downstream Intracellular Signaling”, Miller, E. W.; Dickinson, B. C.; Chang, C. J. *Proc. Natl. Acad. Sci USA* **2010**, *107*, 15681-15686.
5. “Imaging *Hydrogen* Peroxide Production in Living Mice with a Chemoselective Bioluminescent Reporter”, Van de Bittner, G. C.; Dubikovskaya, E. A.; Bertozzi, C. R.; Chang, C. J. *Proc. Natl. Acad. Sci USA* **2010**, *107*, 21316-21321.
6. “Nox2 Redox Signaling Maintains Essential Cell Populations in the Brain”, Dickinson, B. C.; Peltier, J.; Stone, D.; Schaffer, D. V.; Chang, C. J. *Nature Chem. Biol.* **2011**, *7*, 106-112.

7. "Calcium-dependent copper redistributions in neuronal cells revealed by a fluorescent copper sensor and X-ray fluorescence microscopy", Dodani, S. C.; Domaille, D. W.; Nam, C. I.; Miller, E. W.; Finney, L. A.; Vogt, S.; Chang, C. J. *Proc. Natl. Acad. Sci. USA* 2011, *108*, 5980-5985.
8. "Near-infrared fluorescent sensor for in vivo copper imaging in a murine Wilson disease model", Hirayama, T.; Van de Bittner, G. C.; Gray, L. W.; Lutsenko, S.; Chang, C. J. *Proc. Natl. Acad. Sci. USA* 2012, *109*, 2228-2233.
9. "A Molecular MoS_2 Edge Site Mimic for Catalytic Hydrogen Generation", Karunadasa, H. I.; Montalvo, E.; Sun, Y.; Majda, M.; Long, J. R.; Chang, C. J. *Science* 2012, *335*, 698-702.
10. "Cell-trappable Fluorescent Probes for Endogenous Hydrogen Sulfide Signaling and Imaging H_2O_2-Dependent H_2S Production", Lin, V. S.; Lippert, A. R.; Chang, C. J. *Proc. Natl. Acad. Sci. USA* 2013, 7131-7135.

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EXPERIENCE

2009 – present	Associate Professor, Department of Chemistry, Princeton University
2002 – 2009	Assistant Professor, Department of Chemistry, UC Berkeley
1999 – 2002	Post-doc Research Associate, Harvard University
1999	Ph.D., Physical Chemistry, Department of Chemistry, UC Berkeley
1991	B.Sc., Chemistry, Department of Chemistry, National Taiwan University

CURRENT RESEARCH ACTIVITIES

- the development and application of time-dependent single-molecule spectroscopy to protein conformational dynamics;
- intra-cellular local temperature;
- high-fidelity multi-resolution 3D spectral imaging;
- manipulation of nano- and micro-swimmers by photon nudging.

HONORS AND AWARDS

- Xingda Lecture, Peking University, 2012
- Camille Dreyfus Teacher-Scholar Award, 2008-2013
- Alfred P. Sloan Research Fellow, 2006
- Hellman Family Faculty Fund Award, 2005
- NSF CAREER Award, National Science Foundation, 2004

SELECTED PUBLICATIONS

1. “Harnessing Thermal Fluctuations for Purposeful Activities: The Manipulation of Single Micro-swimmers by Adaptive Photon Nudging,” by Bian Qian, Daniel

Montiel, Andreas Bregulla, Frank Cichos, and Haw Yang, *Chem. Sci.*, 4, 1420 (**2013**).

2. "An Accessible Approach to Preparing Water-Soluble Mn2+-doped (CdSSe)ZnS (Core)Shell Nanocrystals for Ratiometric Temperature Sensing," C.-H. Hsia, A. Wuttig, and H. Yang, *ACS Nano*, 5, 5911–5922 (**2011**).
3. "Quantum Dot Nano Thermometers Reveal Heterogeneous Local Thermogenesis in Living Cells," J.-M. Yang, H. Yang, and L. Lin, *ACS Nano*, 5, 5067–5071 (**2011**).
4. "Seeing the Forest for the Trees: Fluorescence Studies of Single Enzymes in the Context of Ensemble Experiments," Y.-W. Tan and H. Yang, *PhysChemChemPhys*, 13, 1709–1721 (**2011**).
5. "Real-time three-dimensional single-particle tracking spectroscopy for complex systems," D. Montiel and H. Yang, *Laser and Photons Rev.*, 3, 374–385 (**2010**). (Published on-line: June 2, **2009**.)
6. "Dynamic active site protection by the M. tuberculosis protein tyrosine phosphatase PtpB lid domain," E. M. Flynn, J. A. Hanson, T. Alber, and H. Yang, *J. Am. Chem. Soc.*, 132, 4772-4780 (**2010**).
7. "Progress in Single-Molecule Spectroscopy in Cells," H. Yang, *Curr. Opin. Chem. Biol.*, 14, 3-9 (**2010**).
8. "The Orientation Factor in Single-Molecule Förster-Type Resonance Energy Transfer with Examples for Conformational Transitions in Proteins," H. Yang, *Israel J. Chem.*, 49, 313-322 (**2009**).
9. "Direct Mg^{2+} binding activates Adenylate Kinase from Escherichia coli," Y.-W. Tan, J. A. Hanson, and H. Yang, *J. Biol. Chem.*, 284, 3306 (**2009**).
10. "Observation of correlated emission intensity and polarization fluctuations in single CdSe/ZnS quantum dots," D. Montiel and H. Yang, *J. Phys. Chem. A*, 112, 9352-9355 (**2008**).
11. "Detection and Characterization of Dynamical Heterogeneity in an Event Series Using Wavelet Correlation," H. Yang, *J. Chem. Phys.*, 129, 074701 (**2008**).
12. "Observation of Spectral Anisotropy of Gold Nanoparticles by Single-Particle Tracking Spectroscopy," H. Cang, D. Montiel, C. S. Xu, and H. Yang, *J. Chem. Phys.* 129, 044503 (**2008**).
13. "Progress in Single-Molecule Tracking Spectroscopy," H. Cang, C. S. Xu, and H. Yang, Chem*. Phys. Lett.*, 457, 285-291 (**2008**).
14. "New role for DNA looping in phage ," L. M. Anderson and H. Yang, *Proc.*

Natl. Acad. Sci. USA, 105, 5827-5832 (2008).

15. "Model-Free Statistical Reduction of Single-Molecule Time Series," H. Yang, in Theory and Evaluation of Single-Molecule Signals edited by E. Barkai, F. Brown, M. Orrit, and H. Yang, *World Scientific Publishing*, October (2008).
16. "Illuminating the Mechanistic Roles of Enzyme Conformational Dynamics," J. A. Hanson, K. Duderstadt, L. P. Watkins, S. Bhattacharyya, J. Brokaw, J.-W. Chu, and H. Yang, *Proc. Natl. Acad. Sci. USA,* 104, 18055-18060 (2007).

Hao Zhang

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Homepage: http://supramol.jlu.edu.cn/

EXPERIENCE

2007-present	Professor, State Key Laboratory of Supramolecular Structure and Materials, Jilin University
2004-2007	Postdoc and AvH research fellow, Department of Interfaces, Max-Planck Institute of Colloids and Interfaces
1999-2004	Ph.D., State Key Laboratory of Supramolecular Structure and Materials, Jilin University
1995-1999	B.Sc., Department of Chemistry, Jilin University

CURRENT RESEARCH ACTIVITIES

My research relates to inorganic nanocrystals (NCs) and polymers. NPs have different functionalities, and they are potentially useful in many research fields, such as hybrid light-emitting devices, solar cells, and sensors. However, in the development of the devices, there are many basic problems to be solved, such as the spatial distribution and conjugation model between different building blocks. So, my research is to prepare composites from NCs and polymers, and in particular reveal the physicochemical mechanism during this procedure. Thus, my works involve following four parts. The preparation of NCs through green chemical routes; control the self-assembly of NCs to integrate the function; fabrication of NC-polymer composites using different methods; and modulation of the functions of NCs in the preformed nanocomposites.

SELECTED PUBLICATIONS

1. "Conducting the temperature-dependent conformational change of macrocyclic compounds to the lattice dilation of quantum dots for achieving ultrasensitive nanothermometer", Ding Zhou, Min Lin, Xun Liu, Jing Li, Zhaolai Chen, Dong Yao, Haizhu Sun, Hao Zhang*, Bai Yang, *ACS Nano*, **2013**, 7, 2273-2283.

2. “Alkylthiol-enabled Se powder dissolution in oleylamine at room temperature for the phosphine-free synthesis of copper-based quaternary selenide nanocrystals”, Yi Liu, Dong Yao, Liang Shen, Hao Zhang*, Xindong Zhang, Bai Yang, *J. Am. Chem. Soc.*, **2012**, 134, 7207-7210.
3. “Hybridization of inorganic nanoparticles and polymers to create regular and reversible self-assembly architectures”, Hao Zhang, Yi Liu, Dong Yao, Bai Yang*, *Chem. Soc. Rev.*, **2012**, 41, 6066-6088.
4. “Coating urchin-like gold nanoparticles with polypyrrole thin shell to produce the photothermal agents with high stability and photothermal transduction efficiency”, Jing Li, Jishu Han, Tianshu Xu, Changrun Guo, Xinyuan Bu, Hao Zhang*, Liping Wang*, Hongchen Sun* and Bai Yang, *Langmuir*, **2013**, 29, 7102-7110.
5. “Synthesis of Cu2-xSe nanocrystals by tuning the reactivity of Se”, Yi Liu, Qingfeng Dong, Haotong Wei, Yang Ning, Haizhu Sun, Wenjing Tian, Hao Zhang*, Bai Yang, *J. Phys. Chem. C*, **2011**, 115, 9909-9916.
6. “Controllable synthesis of stable urchin-like gold nanoparticles using hydroquinone to tune the reactivity of gold chloride”, Jing Li, Jie Wu, Xue Zhang, Yi Liu, Ding Zhou, Haizhu Sun, Hao Zhang*, Bai Yang, *J. Phys. Chem. C*, **2011**, 115, 3630-3637.
7. “Growth kinetics of aqueous CdTe nanocrystals in the presence of simple amines”, Jishu Han, Xintao Luo, Ding Zhou, Haizhu Sun, Hao Zhang*, Bai Yang, *J. Phys. Chem. C*, **2010**, 114, 6418-6425.
8. “Nucleation of aqueous semiconductor nanocrystals: a neglected factor for determining the photoluminescence”, Ding Zhou, Jishu Han, Yi Liu, Min Liu, Xue Zhang, Hao Zhang*, Bai Yang, *J. Phys. Chem. C*, **2010**, 114, 22487-22492.
9. “Improvement of the stability of colloidal superparticles by polypyrrole modification”, Jie Wu, Xue Zhang, Tongjie Yao, Jing Li, Hao Zhang*, Bai Yang, *Langmuir*, **2010**, 26, 8751-8755.
10. “Structural fabrication and functional modulation of nanoparticle-polymer composites”, Hao Zhang, Jishu Han, B. Yang*, *Adv. Funct. Mater.*, **2010**, 20, 1533-1550.

Peidong Yang

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Fax: 1-510-642-7301
E-mail: p_yang@berkeley.edu

EXPERIENCE

2012- present	S. K. and Angela Chan Distinguished Chair in Energy
2010-2012	Department Head, North Site Director, Joint Center for Artificial Photosynthesis.
2009-present	Founder, Alphabet Energy, Inc.
2009- present	Senior Faculty Scientist, Materials Science Division, Lawrence Berkeley National Laboratory
2008-2009	Miller Professor, Department of Chemistry
2007- present	Professor of Chemistry
2005- present	Professor of Materials Science and Engineering
2004- present	Deputy Director, Center of Integrated Nanomechanical Systems, Berkeley
2004-2007	Associate Professor of Chemistry, University of California, Berkeley
2002-2009	Faculty Scientist, Materials Science Division, Lawrence Berkeley National Laboratory
2001-2009	Founding Member, Scientific Advisory Board, Nanosys, Inc.
2002-2004	ChevronTexaco Assistant Professor, Department of Chemistry.
1999-2004	Assistant Professor of Chemistry, University of California, Berkeley.
1997-1999	Postdoc, Department of Chemistry, University of California, Santa Barbara (with Galen Stucky).
1993-1997	Ph.D. in Chemistry, Harvard University, 1997 (with Charles Lieber).
1988-1993	B. S. in Chemistry, University of Science and Technology of China, P. R. China

CURRENT RESEARCH ACTIVITIES

Materials and solid state chemistry; nanostructure synthesis, assembly and characterization; nanophotonics; energy conversion (photovoltaics, artificial photosynthesis and thermoelectrics).

HONORS AND AWARDS

2013 Honorary Professor, Xiamen University; ACS Inorganic Nanoscience Award; Suzhou International Cooperation Award

2012 Honorary Professor, Fudan University; R&D 100 Award; Elected as member of American Academy of Arts and Science; Honorary Professor, The University of Queensland

2011 MRS Medal; Baekeland Medal; No. 1 materials scientist of the past decade based on citation/paper (ISI/Thomson Reuters); Top 10 chemists of the past decade based on citation/paper (ISI/Thomson Reuters)

2010 R&D 100 Award; MRS Fellow

2008 Miller Professorship; Scientific American 50 Award; In-cites top 3 most-cited materials scientists in the world 1998-2008 (No. 2).

2007 NSF Alan T. Waterman Award;

2006 Yangtze Scholar, Chinese Ministry of Education;

2005 ACS Pure Chemistry Award

2004 Julius Springer Prize for Applied Physics; MRS Outstanding Young Investigator Award; Camille Dreyfus Teacher-Scholar Award; Dupont Young Professor Award

2003 Outstanding Performance Award (LBNL); MIT Tech. Review TR 100; First Chair, American Chemical Society, Nanoscience Subdivision; ChevronTexaco Chair in Chemistry, Berkeley

2002 Beckman Young Investigator Award

2001 ACS ExxonMobil Solid State Chemistry Award; Hellman Award; NSF CAREER award; Alfred P. Sloan Fellow; Research Innovation Award

2000 3M untenured faculty award

1999 Dreyfus New Faculty Award

SELECTED PUBLICATIONS

1. "The Emerging Discipline of Systems Materials Engineering", P. Yang, J. Tarascon, *Nature Mater*. 11, 560, 2012.
2. "Nanowire-based Single Cell Endoscopy", R. Yan, J. Park, Y. Choi, C. Heo, S.

Yang, L. P. Lee, P. Yang, *Nature Nano*. 7, 191, 2012.

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4. "Nanowire Photonics", *Nature Photonics* (invited review), D. Gargas, R. Yan, P. Yang, 3, 569, 2009.
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Abstracts

Carbon Dioxide Capture and Hydrocarbon Separations in Metal-Organic Frameworks

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Owing to their high surface areas, tunable pore dimensions, and adjustable surface functionality, metal-organic frameworks (MOFs) can offer advantages for a variety of gas storage and gas separation applications. In an effort to help curb greenhouse gas emissions from power plants, we are developing new MOFs for use as solid adsorbents in post- and pre-combustion CO_2 capture, and for the separation of O_2 from air, as required for oxy-fuel combustion.[1] In particular, MOFs with open metal cation sites or alkylamine-functionalized surfaces are demonstrated to provide high selectivities and working capacities for the adsorption of CO_2 over N_2 under dry flue gas conditions. Breakthrough measurements further show compounds of the latter type to be effective in the presence of water, while calorimetry data reveal a low regeneration energy compared to aqueous amine solutions.[2] MOFs with open metal cation sites, such as Mg_2(dobdc) ($dobdc^{4-}$ = 2,5-dioxido-1,4-benzenedicarboxylate), are highly effective in the removal of CO_2 under conditions relevant to H_2 production, including in the presence of CH_4 impurities.[3] Redox-active Fe^{2+} sites in the isostructural compound Fe_2(dobdc) allow the selective adsorption of O_2 over N_2 via an electron transfer mechanism.[4] The same material is demonstrated to be effective at 45 °C for the fractionation of mixtures of C1 and C2 hydrocarbons, and for the high-purity separation of ethylene/ethane and propylene/propane mixtures.[5] Finally, it will be shown that certain structural features possible within MOFs, but not in zeolites, can enable the fractionation of hexane isomers according to the degree of branching or octane number.[6]

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Towards Designed Synthesis of Zeolitic Porous Materials

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Zeolitic porous materials are widely used in chemical industry as catalysts, adsorbents and ion-exchangers. Their superior properties are closely related to their unique porous framework structures, as well as compositions and morphologies. The ever-growing needs in applications have become the driving force for rational design and synthesis of zeolitic functional materials. In this presentation, I will describe some computational methods for the structural design of zeolites with desired porous structures, and present our synthetic efforts towards the rational synthesis of zeolitic materials with specific pore structures, morphologies, and functions. Finally, the future perspective on the rational synthesis of zeolitic porous materials will be described.

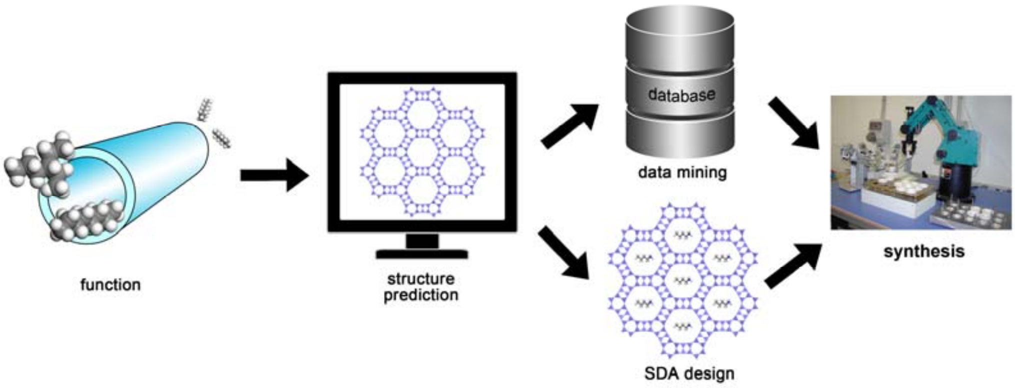

Figure 1 Engineering for accessing the rational synthesis of zeolitic porous materials with desired functions and structures

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Molecular Approaches to Catalytic Production of Hydrogen from Water

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Hydrogen is an attractive candidate as a molecular fuel for carbon-neutral energy conversion cycles. We have initiated a program aimed at creating new molecular catalysts for generating hydrogen from water, with particular interest in developing earth-abundant metal systems that operate in green aqueous media and do not generate organic byproducts during catalysis.[1-7] This talk will present our latest results on the use of polypyridine platforms and their applications to electrocatalytic and photocatalytic generation of hydrogen from water, as well as related work on carbon dioxide fixation.

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Towards Single-Molecule Activity in Living Cells

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This presentation will outline some technological advances developed in my laboratory—including instrumentation,[1, 2] quantum-dot nanothermometers,[3, 4] manipulating micro-swimmers,[5] as well high-definition 3D imaging—in an attempt to address the general question of molecular activity in living cells.[6] As an example, we discuss a recent experiment that shaped our current view for the local temperatures inside living cells—a fundamental parameter in chemical kinetics yet hitherto underappreciated in molecular cell biology. Specifically, quantum dots have been used as nano thermometers to follow the localized, transient temperature response inside individual living cells. It was found that the temperature responses following chemical and physical stresses were highly heterogeneous. This experiment raises exciting new possibilities, including further innovations in nanomaterials for long-term monitoring of local responses, as well as the concept of subcellular temperature gradient for signaling and regulation in cells.

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Nanocrystal/Polymer Composites with Supramolecular Structures

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Inorganic nanocrystals (NCs) with diversified functionalities are promising candidates in future optoelectronic and biomedical applications, which greatly depend on the capability to arrange NCs into higher-order architectures in controllable way. This issue is considered to be solved by means of self-assembly. NCs can participate in the self-assembly with different manners, such as the smart self-organization with blended molecules, as the carriers of host molecules to bear assembly and disassembly with guest molecules, as the netpoints to endow the architectures specific functionalities, and so forth. To enhance the structural stability of the as-prepared assembly architectures, polymers have been utilized to create NC/polymer composites. Meanwhile, such strategy also demonstrates the possibility for integrating the functionalities of NCs and/or polymers by forming regular architectures. Our researches are focused on the fabrication of NC/polymer composites with ordered one-dimensional (1D), 2D or 3D NC array in the composites, which permit to control the NC interactions and hence the functionalities.

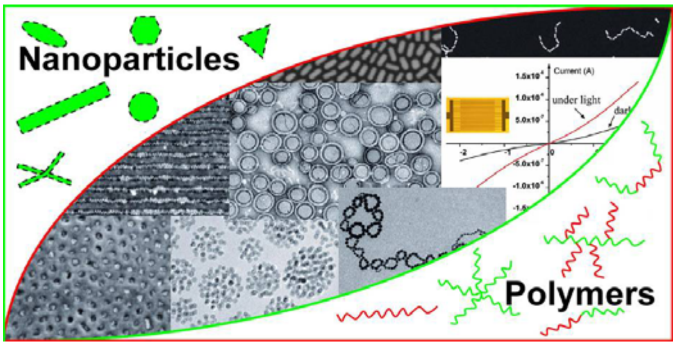

***Figure 1** Schematic illustration of the flexibility in control NC spatial distribution in polymer-based nanocomposites.*

Semiconductor Nanowires for Artificial Photosynthesis

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Nanowires, with their unique capability to bridge the nanoscopic and macroscopic worlds, have already been demonstrated as important materials for different energy conversion. One emerging and exciting direction is their application for solar to fuel conversion. The generation of fuels by the direct conversion of solar energy in a fully integrated system is an attractive goal, but no such system has been demonstrated that shows the required efficiency, is sufficiently durable, or can be manufactured at reasonable cost. One of the most critical issues in solar water splitting is the development of suitable photoelectrodes with high efficiency and long-term durability in an aqueous environment. Semiconductor nanowires represent an important class of nanostructure building block for direct solar-to-fuel application because of their high surface area, tunable bandgap and efficient charge transport and collection. Nanowires can be readily designed and synthesized to deterministically incorporate heterojunctions with improved light absorption, charge separation and vectorial transport. Meanwhile, it is also possible to selectively decorate different oxidation or reduction catalysts onto specific segments of the nanowires to mimic the compartmentalized reactions in natural photosynthesis.

Recently, We have developed a fully integrated system of nanoscale photoelectrodes assembled from inorganic nanowires for direct solar water splitting. Similar to the photosynthetic system in a chloroplast, the artificial photosynthetic system comprises two semiconductor light absorbers with large surface area, an interfacial layer for charge transport, and spatially separated cocatalysts to facilitate the water reduction and oxidation. Under simulated sunlight, a 0.12% solar-to-fuel conversion efficiency is achieved, which is comparable to that of natural photosynthesis. The result demonstrates the possibility of integrating material components into a functional system that mimics the nanoscopic integration in chloroplasts. It also provides a conceptual blueprint of modular design that allows incorporation of newly discovered components for improved performance.