

Yuguang Cai

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Degrees

2003 Ph.D. Chemistry, Princeton University.
2000 M.A. Chemistry, Princeton University.
1996 B.Sc. Chemistry, Peking University, China.

Education & Employments

2019- Adjunct Assistant Professor, Department of Chemistry, University of Kentucky
2017- Senior Academic Coordinator, Department of Chemistry, University of Kentucky
2015-2016 Visiting Scholar, Department of Chemical Engineering, University of Kentucky
2006-2013 Assistant Professor, Department of Chemistry, University of Kentucky
2003-2006 Post-doctoral Research Associate.
Physics Department, Brookhaven National Laboratory.
(Advisor: Dr. Benjamin M. Ocko)
1997-2003 Graduate Student, Princeton University. (Advisor: Dr. Steven L. Bernasek)
1991-1996 Undergraduate Student, Peking University.
(Advisors: Prof. Huang Huizhong & Prof. Wu Nianzu)

Teaching Experience

2006-2009	Fall Semester	CHE-440G, Introduction to Physical Chemistry
2007-2013, 2017-2021	Fall & Spring Semester	CHE-441G, Physical Chemistry Laboratory
2007	Fall Semester	CHE-776, Physical Chemistry Seminar
2011	Fall Semester	CHE-580, Surface Chemistry and Analysis
2017-2021	Fall & Spring Semester	CHE-422 Instrumental Analysis
2018	Fall Semester	CHE-547 Principle of Physical Chemistry (Quantum Chemistry and Spectroscopy)
2019-2021	Spring Semester	CHE-442G Thermodynamics and Kinetics
2019-2021	Fall Semester	CHE-446G Physical Chemistry For Engineers

Publications

- (1) Ramsahoye, M.; Pandeya, A. Cai, Y.G. and Wei, Y. N. Observations of Compound Penetration in Escherichia coli using Ethidium Bromide as a Model Compound. *Biophysical J.* **2020**, 118, 230A-231A.
- (2) Cai, Y.G.*, Wilktop, T. and Wei, Y.N. Data on spectrum-based fluorescence resonance energy transfer measurement of E. coli multidrug transporter AcrB. *Data in Brief* **2018**, 21, 1649-1653.
- (3) Aher, A.; Cai, Y.G.; Majumder, M. and Bhattacharyya, D. Synthesis of graphene oxide membranes and their behavior in water and isopropanol. *Carbon* **2017**, 116, 145-153.
- (4) Zhang, X.N. and Cai, Y.G.* Ultra-low Voltage Electrowetting on Solid-like Ionic Liquid Dielectric Layer. *Angew Chem. Int. Ed.* **2013**, 52, 2289. (Featured article in *Advances in Engineering*).
- (5) Zhang, X.N.; Lu, L.B. and Cai, Y.G.* Surface Properties of Ionic Liquid Adsorbate Layer Are Influenced by the Dipole of Underneath Substrate. *Langmuir*, **2012**, 28, 9593.
- (6) Fang, J.; Zhang, X.N.; Chai, Q.; Clements, W.H.; Cai, Y.G. and Wei, Y.N. Noncovalent Interactions in YajC-CT Fibrillation and Gelation — Effects of Detergent, Urea, Salt, and Glycerol. *J. Bio. Res.*, **2012**, 1.
- (7) Liu, W.; Lu, L.B.; Li, Y.L.; Cai, Y.G. and Sekulic, D.P. Preferential Spreading of Molten Metal over an Anisotropically Microstructured Surface. *Eur. Phys. Lett.* **2012**, 97, 46003.
- (8) Zhang, X.N. and Cai, Y.G.* Octadecyltrichlorosilane (OTS)-coated Ionic Liquid Drops: Micro-reactors for Homogenous Catalytic Reactions at Designated Interfaces. *Beilstein J. Nanotech.* **2012**, 3, 33.
- (9) Liu, W.; Li, Y.L.; Cai, Y.G. and Dusan, S. Capillary Rise of Liquids over a Microstructured Solid Surface. *Langmuir*, **2011**, 27, 14260.
- (10) Trajkovic, S.; Zhang, X. N.; Daurnert, S.; Cai, Y. G.*; Atomic Force Microscopy Study of the Conformational Change in Immobilized Calmodulin. *Langmuir* **2011**, 27, 10793.
- (11) Lu, L.B. and Cai, Y.G.* Molecular Tilting and Its Impact on Frictional Properties of n-Alkane Self-Assembled Monolayer. *Langmuir*, **2011**, 27, 5953.
- (12) Fang, J.; Zhang, X.N.; Cai, Y.G. and Wei, Y.N. Small Globular Protein Motif Forms Particulate Hydrogel under 2 Various pH Conditions. *Biomacromolecules* **2011**, 12, 1587.
- (13) Cai, Y.G.* and Lu, L.B. The Scanning Probe Based Deep Oxidation Lithography and Its Application in Studying the Spreading of Liquid n-Alkane in *Scanning Probe Microscopy in Nanoscience and Nanotechnology*, Vol. 2 Edited by B. Bhushan Springer-Verlag, Heidelberg, **2011**.
- (14) Lu, L. B.; Zander, K. J.; Cai, Y. G.* The Stability of Parallel Layer During the Alkane Spreading and the Domain Structures of the Standing-up Layer. *Langmuir* **2010**, 26, 5624.
- (15) Fang, J.; Yu, L. L.; Gao, P.; Cai, Y. G.; Wei, Y. N. Detection of Protein-DNA Interaction and Regulation Using Gold Nanoparticles. *Anal. Biochem.* **2010**, 399, 262.
- (16) Gao, P.; Cai, Y. G.* Aptamer Fiber Anchored on the Edge of a Protein Pattern: A Template for Nanowire Fabrication. *ACS Nano* **2009**, 3, 3475.
- (17) Lu, L. B.; Cai, Y. G.* The Role of Vapor Phase Mass Transport During the Spreading of a Long Chain Alkane Drop. *Langmuir* **2009**, 25, 13914.
- (18) Cai, Y. G.* The Partially Degraded Hydrophilic Silane Pattern and Its Application in Studying the Structures of Long Chain Alkane Films. *Langmuir* **2009**, 25, 5594.

- (20) Gao, P.; Cai, Y.G.* A Method for Fabricating Protein Patterns on the Octadecyltrichlorosilane (OTS) Surface through Paper Swabbing. *Ultramicroscopy* **2009**, 109, 1023.
- (21) Gao, P.; Cai, Y. G.* Label-Free Detection of the Aptamer Binding on Protein Patterns Using Kelvin Probe Force Microscopy (KPFM). *Anal. Bioanal. Chem.* **2009**, 394, 207. (**Cover Story**, Mentioned by *C&EN News* **87**, 30, 2009)
- (22) Gao, P.; Cai, Y. G.* The Boundary Molecules in a Lysozyme Pattern Exhibit Preferential Antibody Binding. *Langmuir* **2008**, 24, 10334.
- (23) Cai, Y. G.* Iodine Patterns on Chemical Templates. *ECS Transaction* **2008**, 13, 129.
- (24) Cai, Y. G.* Chemical Template Directed Iodine Patterns on the Octadecyltrichlorosilane Surface. *Langmuir* **2008**, 24, 337.
- (25) Checco, A.; Cai, Y.G.; Gang, O.; Ocko, B. M. High Resolution Non-Contact AFM Imaging of Liquids Condensed onto Chemically Nanopatterned Surfaces. *Ultramicroscopy* **2006**, 106, 703.
- (26) Cai, Y.G.; Ocko, B. M. Electro Pen Nanolithography. *J. Am. Chem. Soc.* **2005**, 127, 16287.
- (27) Cai, Y.G.*; Ocko, B. M. Large-Scale Fabrication of Protein Nanoarrays Based on Nanosphere Lithography. *Langmuir* **2005**, 21, 9274.
- (28) Liu, G.; Cai, Y. G.; Liu, T. B. Automatic and Subsequent Dissolution and Precipitation Process in Inorganic Macroionic Solutions. *J. Am. Chem. Soc.* **2004**, 126, 16690.
- (29) Tao, F.; Cai, Y. G.; Bernasek, S. L. Scanning Tunneling Microscopy Studies of the Self-Assembly of Carboxylic Esters on Graphite: Linear Distortion and Multiple Adsorption Structures. *Langmuir* **2005**, 21, 1269.
- (30) Cai, Y. G.; Bernasek, S. L. Structures Formed by the Chiral Assembly of Racemic Mixtures of Enantiomers: Iodination Products of Elaidic and Oleic Acids. *J. Phys. Chem. B* **2005**, 109, 4514. (**Cover Story**)
- (31) Cai, Y. G.; Bernasek, S. L. Adsorption-Induced Asymmetric Assembly from an Achiral Adsorbate. *J. Am. Chem. Soc.* **2004**, 126, 14234.
- (32) Cai, Y. G.; Bernasek, S. L. Chiral Pair Monolayer Adsorption of Iodine-Substituted Octadecanol Molecules on Graphite. *J. Am. Chem. Soc.* **2003**, 125, 1655.
- (33) Cai, Y. G.; Bernasek, S.L., Scanning Tunneling Microscopy of Heterochiral Self-Assembled Monolayers. In *Encyclopedia of Nanoscience and Nanotechnology*, Marcel Dekker Inc.: New York, **2003**; p 3305.
- (34) Cai, Y. G.; Shi, J.; Zhang, S. H.; Zhang, Q.; Huang, H. Z.; Wu, N. Z. Computer Controlled Data System for XPS and SIMS. *Computers and Applied Chemistry* **1998**, 15, 95.

* corresponding author

Presentations

1. Cai, Y. G. Scanning Tunneling Microscopy of Chiral Pair Self-Assembled Monolayers. The 224th American Chemical Society Meeting, Boston, MA, Aug., 2002.
2. Cai, Y. G. Novel Surface Chiral Structures. Physical Electronics Conference, Cornell, Ithaca, NY. Jun., 2003.
3. Cai, Y. G. The Large Scale Fabrication of Protein Nanoarrays Based On Nanosphere Lithography. NanoTech 2005, Anaheim, CA, May, 2005.

4. Cai, Y. G. Electro-pen Nanolithography. The 230th American Chemical Society Meeting, Washington, DC, Aug., 2005.
5. Cai, Y. G. Chemical Template Directed Iodine Patterns on the Octadecyltrichlorosilane Surface. Physical Electronics Conference, Urbana, IL. Jun., 2007.
6. Cai, Y. G. Chemical Template Directed Iodine Patterns on the Octadecyltrichlorosilane Surface. College of Molecular Science and Engineering, Peking University. Beijing, China. Dec., 2007. (Invited)
7. Cai, Y. G. Chemical Template Directed Iodine Patterns on the Octadecyltrichlorosilane Surface. Department of Chemistry, Tsinghua University. Beijing, China. Jan., 2008.
8. Cai, Y. G. The Boundary Protein Molecules Show Higher Antibody Binding Affinity Than The Interior Protein Molecules In A Protein Pattern. 2008 KYNANOMAT Workshop, Louisville, KY. Mar., 2008.
9. Cai, Y. G. Iodine Patterns on the Chemical Templates. Young Investigator Symposium, 213th Electrochemical Society, Phoenix, AZ. May, 2008. (Invited)
10. Gao, P. and Cai, Y. G. The “Edge Effect” in an Immobilized Protein Pattern towards the Antibody Binding. The 82nd ACS Colloid and Surface Science Symposium. Raleigh, NC. Jun., 2008.
11. Cai, Y. G. The Boundary Protein Molecules In a Protein Pattern Show A Preferential Antibody Binding. 15th International Scanning Probe Microscopy Conference, Seattle, WA. Jun., 2008.
12. Gao, P. and Cai, Y. G. The “Edge effect” in an immobilized protein pattern towards the aptamer binding. Kentucky Academy of Science Annual Meeting, Lexington, KY. Nov. 2008. (**First Prize**)
13. Cai, Y. G. Role of Vapor-Phase Mass Transport During the Liquid Alkane Spreading. Kentucky Academy of Science Annual Meeting, KY. Nov. 2009.
14. Cai, Y. G. The Spreading of Liquid Alkanes on Surface. University of Delaware, Mar., 15, 2010. (Invited)
15. Cai, Y. G. A New Perspective Towards an Old Problem: the Role of Vapor during the Spreading of Liquid Alkane. Agilent e-Seminar Oct., 2010. (Invited)
16. Lu, L.B. and Cai, Y. G. The Carboxylic Acid-Bound Iodine Layer – Towards an Anti-Fouling Coating for Water Sensors and Water Treatment Facilities. Kentucky Water Resources Annual Symposium. Lexington, KY. Mar. 2011.
17. Cai, Y. G. Molecular Tilting in Alkane Film and Its Effect on Friction. 241st ACS National Meeting. Anaheim, CA, Mar., 2011.
18. Zhang, X. N. and Cai, Y. G., Atomic Force Microscopy Study of the Orientational Difference in Immobilized Calmodulin. Neutrons in Structural Biology Symposium. Oak Ridge National Laboratory, Oak Ridge, TN, Jun. 2012.
19. Zhang, X. N. and Cai, Y. G., Octadecyltrichlorosilane (OTS)-coated Ionic Liquid Drops: Micro-reactors for Homogenous Catalytic Reactions at Designated Interfaces. 2012 Kentucky Academy of Science (KAS) Annual Meeting, Richmond, Ky, Oct. 2102.
20. Zhang, X. N. and Cai, Y. G., Surface Properties of Ionic Liquid Adsorbate Layer Are Influenced by the Dipole of the Underneath Substrate. 2012 Southeastern Regional Meeting of the American Chemical Society (ACS), Raleigh, NC, Nov. 2012.
21. Zhang, X. N. and Cai, Y. G., Kelvin Probe Force Microscopy (KPFM) Study of the Conformational Change and Orientational Difference in Immobilized Calmodulin (CaM). 245th American Chemical Society (ACS) National Meeting, New Orleans, LA, Mar., 2013.

Poster Presentation

1. Cai, Y.G. The Scanning Probe Deep Oxidation Lithography and its Application in Studying the Alkane Spreading Over Patterned Surfaces Gordon Research Conference. (Surface Gradients) July, NH, 2008.
2. Cai, Y.G. The Pattern-Edge Initiated Aptamer Fibers Fabricated By Scanning Probe Deep Oxidation Lithography. Gordon Research Conference, (Dynamics at Surfaces) Feb., CA, 2009.
3. Wei Y., Fang J., Yu L., Gao P., and Cai Y.G. Protein-DNA Interaction Mediated Assembly of Gold Nanoparticles for the Detection of Effectors. Gibbs Conference on Biological Thermodynamics, Carbondale, IL. Oct, 2009.
4. Trajkovic, S. Daunert, S. and Cai, Y.G. Atomic Force Microscopy (AFM) study of calmodulin conformational change. Advances in Bioactive Materials and Interfaces for Therapeutics and Diagnostics. Lexington, KY. Sep. 2009.
5. Trajkovic, S. Daunert, S. and Cai, Y.G. Atomic Force Microscopy (AFM) study of calmodulin conformational change. Kentucky Academy of Science Annual Meeting, KY. Nov. 2009.
6. Cai, Y.G. and Lu, L.B. Freezing of a Liquid Alkane Drop Sitting on Solid Surface Starts from the Contact Line. Gordon Research Conference, (Reactions at Surfaces) Feb., CA, 2011.

Patents

- (1) Cai, Y.G. and Ocko, B.M. The Electro-Pen Nanolithography (11/097917), pending.
- (2) Cai, Y.G. and Zhang, X.N. Low Voltage Electrowetting Device and Method for Making Same (13/741,458), pending.

Synergistic Activities

Reviewer -

Proceedings of the National Academy of Sciences, Journal of the American Chemical Society, ACS Nano, Analytical Chemistry, Langmuir, ACS Applied Materials & Interfaces, Ultramicroscopy, Journal of Material Chemistry, Analytical and Bioanalytical Chemistry, Journal of Materials Science, Surface and Interface Analysis.

Review Expert -

The Romanian National Council for Development and Innovation, Romania.
Center for Functional Nanomaterials, Brookhaven National Laboratory, Department of Energy.
Defense Threat Reduction Agency, Department of Defense.
Petroleum Research Fund, American Chemical Society.

Host, the Math, Science, and Technology (MSTC) program at the Paul Laurence Dunbar High School, Fayette county public schools district, Kentucky.

Judge, Kentucky Junior Science Academy

Judge, Central Kentucky Regional Science and Engineering Fair

Organizer, the 2010 University of Kentucky Chemistry Regional Poster Competition

Organizer, the 2011 Naff Symposium, Department of Chemistry, University of Kentucky

Students

Former Graduate Students

Dr. Pei Gao (Female), Dr. Lingbo Lu, Dr. Xiaoning Zhang.

Undergraduate Student

Kari J. Zander(Female)

High School Student

Anthony Concepcion (Paul Lawrence Dunbar High School, Hispanic)

Former Mentors

Dr. Steven L. Bernasek (Princeton)

Dr. Benjamin M. Ocko (Brookhaven National Laboratory)