

YUFAN HE

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RESEARCH INTERESTS

- The processes and dynamics that occurred at solid surface or solid/liquid interface, and the related applications. Many important processes, such as crystal growth, energy transfer and storage, catalysis, metal corrosion and protection etc. occurred at solid surface or solid/liquid interface, and these processes involve molecular adsorption/desorption, self-assembly and charge transfer, etc. Studies of the processes and their dynamics can help us understand these important phenomena and develop new applications.
- Enzymatic catalysis reaction and dynamics. Enzymatic catalysis reaction is related with almost all the important biological processes or function, such as Photosynthesis, cellular metabolism, etc. I am interested in the relation between the kinetics of enzymatic reactions and enzymatic conformational fluctuation dynamics in the biological function processes, which will enhance our understanding of biological phenomena at molecular level. That will help us improve and develop new applications in the area of biomedical, biosynthesis, bioenergy, and environment etc.
- Nanoscience and nanotechnology. I am interested in developing new technology to improve our probe ability in Nano-scale.

TECHNICAL SKILLS

- Expertise in single-molecule spectroscopy (fluorescence spectroscopy, Raman spectroscopy, and single-photon counting techniques etc.);
- Expertise in electrochemistry and electrochemical measurements;
- Materials surface analysis: expertise in scanning probe microscopy (scanning tunneling microscopy, atomic force microscopy, especially the combined electrochemistry and scanning probe microscopy), optical microscopy, scanning electron microscopy (SEM), EDAX etc.;
- Surface reaction, cross-link reaction, self-assembly.

RESEARCH EXPERIENCE

Staff Scientist, Department of Biomedical Sciences, Florida State University, from Aug, 2018
Study of enzymatic reaction kinetics and enzymatic conformational dynamics by single molecules spectroscopy.

Research Scientist, Department of Chemistry and the Center for Photochemical Sciences, Bowling Green State University, 2006 – 2018,

- Study of the dynamics of energy transfer, electron transfer at solid/liquid interface by using single-molecule fluorescence spectroscopy and Raman spectroscopy and combined scanning probe microscopy.
- Study of enzymatic reaction dynamics by single molecules spectroscopy.

Adjunct Research Assistant Professor, Department of Chemistry, Temple University. 2006 – 2010

- Molecule-metal contacts and electron transport through single molecules
- Nanoscale dynamics at solid/liquid interfaces

Research Assistant Professor, Department of Chemistry, Temple University. 2005 – 2006

Nanoscale dynamics at solid/liquid interfaces

- Molecule-metal contacts and electron transport through single molecules

Postdoctoral Research Associate, Department of Chemistry, Temple University, 2004-2005

Nanoscale dynamics at solid/liquid interfaces

Postdoctoral Research Associate, Department of Chemistry, University of Pittsburgh. 2000-2004,
Nanoscale dynamics at solid/liquid interfaces,

(1) Metastable nanoscale island growth and dissolution as well as the effect of local environment at the metal-electrolyte interface by STM.

(2) Potential modulated molecule-substrate interaction and molecular self-assembly at electrochemical interfaces by STM.

- Molecular electronic conduction and electron transfer through organic molecules,

(1) Design and synthesis of new organic molecular wires that enhance the conductivity by optimizing the molecule-substrate connection.

(2) Characterized the electron transfer and electronic conduction through molecular wires embedded in self-assembled monolayers.

Postdoctoral Research Associate Department of Chemistry, North Carolina State University. 1999-2000

STM and AFM characterization of self-assembled monolayers and tip induced surface lithography.

Postdoctoral Research Associate State Key Laboratory for Corrosion and Protection of Metals, Institute of Corrosion and Protection of Metals, Chinese Academy of Sciences. 1998-1999

Study of corrosion processes of metals and alloys in atmosphere and marine.

Research Assistant with Laboratory of Electroanalytical Chemistry, Changchun Institute of Applied Chemistry, Chinese Academy of Sciences. 1994-1998

- Study of molecular adsorption/desorption and electron transfer at electrode-electrolyte interfaces by electrochemical STM,

Research Assistant Department of Chemical Engineering, Shanghai University of Technology. 1990-1993

Co-deposition of (Fe-Ni)Cr and the processes of alloy formation.

- Recycling of solid waste.

EDUCATION

Ph.D. in Analytical Chemistry. 1997

State Key Laboratory of Electroanalytical Chemistry, Changchun Institute of Applied Chemistry, Chinese Academy of Sciences

Advisor: **Professor Erkang Wang**

“Probing the Adsorption and Reactions of Organic Molecules at Electrode-Electrolyte Interfaces”

Master of Engineering in Applied Chemistry. 1993

Department of Environmental Engineering, Shanghai University of Technology

Advisor: **Professor Yuzhong Ye**

“Co-Deposition of (Fe-Ni) Cr and the Processes of Alloy Formation”

PUBLICATIONS

1. S. Roy Chowdhury, Jin Cao, **Yufan He**, and H. Peter Lu, Revealing Abrupt and Spontaneous Ruptures of Protein Native Structure under Pico-Newton Compressive Stress Force Manipulation, *ACS Nano*, **12**, 2448-2454 (2018).
2. Pavel Moroz, Natalia Razgoniaeva, **Yufan He**, Gregory Jensen, Holly Eckard, H. Peter Lu, and Mikhail Zamkov, Tracking the Energy Flow on Nanoscale via Sample-Transmitted Excitation Photoluminescence Spectroscopy, *ACS Nano*, **11**, 4191-4197 (2017).
3. **He Yufan**, Rao G. Vishal, Cao Jin, Lu H. Peter, Simultaneous Spectroscopic and Topographic Imaging of Single-Molecule Interfacial Electron Transfer Reactivity and Local Nanoscale Environment, *J. Phys. Chem. Lett.*, **7**, 2221-2227 (2016).
4. Guo Qing, **He Yufan** and Lu H. Peter, Interrogating the Activities of Conformational Deformed Enzyme by Single Molecule TIRF-Magnetic Tweezers Microscopy, *Proc. Natl. Acad. Sci.*, **112**, 13904-13909 (2015).
5. Jiang Zhoufeng, Bhandari B. Ghadendra, Premathilake Shashini, Khanh Simeen, Dimick M. Douglas, Stombaugh Cody, Mandell Angelic, **He Yufan**, Lu H. Peter and Sun Liangfeng, Growth of colloidal PbS nanosheets and the enhancement of their photoluminescence, *Phys. Chem. Chem. Phys.*, **17**, 23303-23307 (2015).
6. **He Yufan**, Haque Mahfuzul Mohammad, Stuehr J. Dennis, Lu H. Peter, Single-molecule spectroscopy reveals how calmodulin activates NO synthase by controlling its conformational fluctuation dynamics, *Proc. Natl. Acad. Sci.*, **112**, 11835-11840 (2015).
7. Brega Valentina, Zeller Matthias, **He Yufan**, Lu H. Peter and Klosterman K. Jeremy, Multi-Responsive Metal-Organic Lantern Cages in Solution, *Chem. Commun.*, **51**, 5077-5080 (2015).
8. Bhandari, Ghadendra; Subedi, Kamal; **He, Yufan**; Jiang, zhoufeng; Leopold, Matthew; Reilly, Nick; Lu, H. Peter; Zayak, Alexey; Sun, Liangfeng, Thickness-Controlled Synthesis of Colloidal PbS Nanosheets and Their Thickness-Dependent Energy Gaps, *Chem. Mater.*, **26** (19), pp 5433–5436 (2014).
9. Rao Vishal Govind, Dhital Bharat, **He Yufan**, Lu H. Peter, Single-Molecule Interfacial Electron Transfer Dynamics of Porphyrin on TiO₂ Nanoparticles: Dissecting the Complex Electronic Coupling Dependent Dynamics, *J. Phys. Chem. C.*, **118** (35), pp 20209–20221 (2014).
10. Guo Qing, **He Yufan** and Lu H. Peter, Manipulating and probing enzymatic conformational fluctuations and enzyme–substrate interactions by single-molecule FRET-magnetic tweezers microscopy. *Phys. Chem. Chem. Phys.*, **16**, 13052-13058 (2014)
11. Rajapaksha P. Suneth, **He Yufan**, Lu H. Peter, Combined Topographic, Spectroscopic, and Model Analyses of Inhomogeneous Energetic Coupling of Linear Light Harvesting Complex II Aggregates in Native Photosynthetic Membrane. *PhysChemChemPhys*, **15**, 5636-5647 (2013)
12. **He Yufan**, Lu Maolin, Lu H. Peter, Single molecule lifetime-based FRET study of enzymatic conformational dynamics. *PhysChemChemPhys*, **15**, 770-775 (2013). *The paper was published with journal cover page.*
13. **He Yufan**, Lu Maolin, Cao Jin, Lu H. Peter, Manipulating Protein Conformations by Single-Molecule AFM-FRET Nanoscopy, *ACS Nano*, **6**, 1221-1229 (2012).
14. **He Yufan**, Li Yue, Mukherjee Saptarshi, Wu Yan, Yan Honggao, Lu H. Peter, Probing Single-Molecule Enzyme Active-Site Conformational State Intermittent Coherence. *Journal of the American Chemical Society* **133**, 14389-14395 (2011).

15. Wang Yuanmin, Sevinc Papatya, **He Yufan**, Lu H. Peter, Probing Ground-State Single-Electron Self-Exchange Across a Molecule-Metal Interface, *Journal of the American Chemical Society* 133(18), 6989-6996 (2011)
16. **He YF**, Borguet E. Metastable Phase of the Au(111) Surface in Electrolyte Revealed by STM and Asymmetric Potential Pulse Perturbation. *Journal of Physical Chemistry C*, 115(13), 5726-5732 (2011) .
17. **He YF**, Zeng XH, Mukherjee S, Rajapaksha S, Kaplan S, Lu HP. Revealing Linear Aggregates of Light-Harvesting Antenna Protein in Photosynthetic Membranes. *Langmuir*, 26 (1), 307–313(2010). *The paper was published with journal cover page.*
18. Paul A , Watson RM, Lund P, Xing YJ, Burke K, **He YF**, Borguet E, Achim C, Waldeck DH, Charge transfer through single-stranded peptide nucleic acid composed of thymine Nucleotides,*Journal of Physical Chemistry C*, 112 (18) 7233-7240 (2008) .
19. **He YF**, Borguet E, Dynamics of Porphyrin Electron Transfer Reactions at the Electrode-Electrolyte Interface at the Molecular Level. *Angewandte Chemie International Edition*, 46(32) 6098-6101(2007) *The Paper was highlight by Science Daily (Aug 6th, 2007), Space Daily (Aug 8th, 1007) and National Science Foundation News (Aug 2nd, 2007).*
20. Ye T, **He YF**, Borguet E. Adsorption and electrochemical activity: An *in-situ* EC-STM study of electrode reactions and potential induced adsorption of porphyrins. *Journal of Physical Chemistry B*, 110(12) 6141-6147 (2006).
21. Tivanski AV, **He YF**, Borguet E, Liu HY, Walker GC, Waldeck DH. Conjugated thiol linker for enhanced conductivity of gold-molecule contacts. *Journal of Physical Chemistry B*, 109(12) 5398-5402 (2005).
22. Murgida DH, Hildebrandt P, Wei J, **He YF**, Liu HY, Waldeck DH. Surface-enhanced resonance Raman spectroscopic and electrochemical study of cytochrome c bound on electrodes through coordination with pyridinyl-terminated self-assembled monolayers. *Journal of Physical Chemistry B* 108 (7): 2261-2269 (2004).
23. Wei JJ, Liu HY, Dick AR, Yamamoto H, **He YF**, Waldeck DH. Direct wiring of cytochrome c's heme unit to an electrode: Electrochemical studies. *Journal of the American Chemical Society* 124 (32): 9591-9599 (2002).
24. **He Y**, Ye T, Borguet E. Porphyrin self-assembly at electrochemical interfaces: Role of potential modulated surface mobility. *Journal of the American Chemical Society* 124 (40): 11964-11970 (2002) *The Paper was highlight by Chemical & Engineering News (Sept 26, 2002).*
25. **He YF**, Ye T, Borguet E. The role of hydrophobic chains in self-assembly at electrified interfaces: Observation of potential-induced transformations of two-dimensional crystals of hexadecane by *in-situ* scanning tunneling microscopy. *Journal Physical Chemistry B* 106 (43): 11264-11271 (2002).
26. **He YF**, Borguet E. Effect of local environment on nanoscale dynamics at electrochemical interfaces: Anisotropic growth and dissolution in the presence of a step providing evidence for a Schwoebel-Ehrlich barrier at Solid/Liquid interfaces. *Faraday Discussions* 121: 17-25 (2002).
27. **He Y**, Borguet E. Dynamics of metastable nanoscale island growth and dissolution at electrochemical interfaces by time-resolved scanning tunneling microscopy. *Journal of Physical Chemistry B* 105 (18): 3981-3986 (2001).
26. Gorman CB, **He YF**, Carroll RL. The influence of headgroup on the structure of self-assembled monolayers as viewed by scanning tunneling microscopy. *Langmuir* 17 (17): 5324-5328 (2001).

28. Zhang XY, Wang FP, **He YF**, Du YL. Study of the inhibition mechanism of imidazoline amide on CO₂ corrosion of Armco iron. *Corrosion Science* 43 (8): 1417-1431 (2001).
29. Gorman CB, Carroll RL, **He YF**, Tian F, Fuierer R. Chemically well-defined lithography using self-assembled monolayers and scanning tunneling microscopy in nonpolar organothiol solutions. *Langmuir* 16: (15) 6312-6316 (2000).
30. Han Z, **He YF**, Lin HC, Zhao H. Dealloying characterizations of Cu-Al alloy in marine environment. *Journal of Materials Science Letters* 19: (5) 393-395 (2000).
31. Yan CW, **He YF**. Investigation of 2- mercaptobenzoxazole (MBO) inhibitive film on copper. *Journal of Chinese Society for Corrosion and protection* 19:(6) 367-371 (1999).
32. Yan LJ, **He YF**, Lin HC, Wu WT. Study on the inhibition effect of polymer film of propargyl alcohol in Fe/H₂SO₄ and Fe/H₂SO₄+H₂S systems, *Acta Physico-Chimica Sinica* (Chinese) 15: (8) 726-734 (1999).
33. Deng J, **He YF**, Ye F, Long QY, Lung CW, Accurate assessment of the roughness exponent of a fracture surface via scanning tunneling microscopy. *Journal of Physics D: Applied Physics* 32: (12) L45-L48 (1999).
34. **He YF**, Wang Y, Zhu GY, Wang EK, Potential-dependent adsorption/desorption of organic adsorbate at HOPG electrode and accompanying delamination of graphite surface. *Journal of the Electrochemical Society* 146: (1) 250-255 (1999).
35. She YM, Ji YP, **He YF**, Liu SY, Detection of specific noncovalent protein-fullerenols complexes by matrix-assisted laser desorption ionization mass spectrometry. *Chemical Journal of Chinese Universities* (Chinese) 19: (11) 1735-1738 (1998).
36. Zhang BL, **He YF**, Wang EK, Some unusual features of highly oriented pyrolytic graphite observed by electrochemical scanning tunneling microscopy. *Chinese Chemical Letters* 9: (5) 501-504 (1998).
37. **He YF**, Wang EK, Study on the structure of hemoglobin in organic solvents by in situ STM. *Acta Chimica Sinica* (Chinese) 55: (8) 801-805 (1997).
38. **He YF**, Wang Y, Zhu GY, Wang EK, Electrochemical scanning tunneling microscopy and electrochemical quartz crystal microbalance study of the adsorption of phenanthraquinone accompanied by an electrochemical redox reaction on the Au electrode. *Journal of Electroanalytical Chemistry* 440: (1-2) 65-72 (1997)

AWARDS:

NSF-CRC: Long-Range Electron Transfer in Hybrid Inorganic-Peptide Nucleic Acid Nanoscale Assemblies CHE-0628169 (From 09/01/2006 to 08/31/2010)
 (Co- PIs C. Achim, Carnegie Mellon University, E. Borguet, Temple University. M. Madrid, Pittsburgh Supercomputer Center, D. H. Waldeck, University of Pittsburgh)