

# YI-TAO LONG Ph. D.

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## **RESEARCH INTERESTS**

- Nanopore single molecule detection, electrochemical biosensors, nano spectroscopy, coenzyme bioelectrochemistry, nanomaterial chemistry, environmental rapid detection
- Electrochemistry, impedance spectroscopy, *in-situ* spectroelectrochemistry: UV/ESR, surface enhanced raman spectroscopy, and surface FT-Infrared,
- Engineered molecular assemble, interface analysis, X-ray photoelectron spectroscopy(XPS), TEM, SEM, secondary ion mass spectrometry (SIMS)
- Microfluidics, electrophoresis, Chromatographic(HPLC, LC/MS, CE), Lab-on-a-chip, high vacuum system

## **WORK EXPERIENCE**

- 2010- now** Guest IP, Shanghai Institute of Applied Physics, Chinese Academy of Science, Shanghai
- 2009- now** IP, group leader, the CASE(Catalysis and Sensing for our Environment) Joint Laboratory at the University of Bath, the University of Birmingham, and the East China University of Science and Technology
- 2007- now** University Professor, Shanghai Key Laboratory of Functional Materials Chemistry & Department of Chemistry, East China University of Science and Technology(ECUST), Shanghai, P. R. China
- 2006-2007** Senior Research Scientist, Departments of Chemistry and Bioengineering Biomolecular Nanotechnology Center, Berkeley Sensor & Actuator Center University of California, Berkeley, USA
- 2003-2005** Research Associate, Departments of Chemistry University of Saskatchewan, CANADA
- 2001-2003** HSURC Fellow, Departments of Biochemistry and Chemistry University of Saskatchewan, CANADA
- 1999-2001** Postdoctoral fellow, Institute of Applied Physical Chemistry Heidelberg University, GERMANY
- 1989-1993** Engineer of Analytical Chemistry Jiangsu Provincial Center for Public Health & Disease Control, CHINA

## **EDUCATION**

- 1998.12** *Ph.D.* Bioelectrochemistry, Nanjing University, Nanjing, P. R. China
- 1996.01.** *M.Sc.* Analytical Chemistry, Nanjing University, Nanjing, P. R. China
- 1989.07.** *Eng.* Chemistry, Shandong University, Jinan, P. R. China

## **PUBLIC AND PROFESSIONAL SERVICE**

**Journal Review:** Anal. Chem., Analyst, Nanoscale, Biosensor & Bioelectronics, Bioconjugate Chem., Nano. Letts., J. Am. Chem. Soc., Chem. Comm., PCCP., Anal Chim Acta, Electrochim Acta.

**Society Memberships:** The American Chemical Society, the Canadian Chemical Society, the International Coenzyme Q10 Association

## **PUBLICATIONS**

1. He, X. P.; Wang, X. W.; Jin, X. P.; Zhou, H.; Shi, X. X.; Chen, G.-R. and Long Y.-T.\* (corresponding author) (2011): Epimeric Monosaccharide-Quinone Hybrids on Gold Electrode toward the Electrochemical Probing of Specific Carbohydrate-Protein Recognitions. *J. Am. Chem. Soc.* DOI: 10.1021/ja110478j.
2. Qin, L. X.; Ma, W.; Li D.W.; Li, Y.; Chen, X. Y.; Kraatz, H. B.; James, T. D. and Long, Y.-T.\* (corresponding author) (2011): Coenzyme Q Functionalized CdTe/ZnS Quantum Dots for ROS Imaging. *Chemistry - A European Journal*, in press.
3. Li, Y.; Shi, L.; Qin, L. X.; Lan, M. B.; James, T. D. and Long, Y.-T.\* (2011): An OFF-ON fluorescent probe for Zn<sup>2+</sup> based on a GFP-inspired imidazolone derivative attached to a 1,10-phenanthroline moiety. *Chem. Commun.*, (cover). DOI:10.1039/c1cc10210a.
4. Wang, H.Y.; Ying, Y.L.; Li, Y.; Kraatz, H. B. and Long, Y.-T.\* (corresponding author) (2011): Nanopore Analysis of  $\beta$ -Amyloid Peptide Aggregation Transition Induced by Small Molecules. *Anal. Chem.*, 83 (5), 1746–1752.
5. Wang, X.W.; Ma, W.; Ying, Y.L.; Liang, J. and Long, Y.-T.\* (corresponding author) (2011): Bis-coenzyme Q0: Synthesis, Characteristic and Application, *Chemistry - An Asian Journal (front cover)*. DOI:10.1002/asia.201000477.
6. Shi, L.; Song, W.; Li, Y.; Li, D. W.; Swanick, K.N.; Ding, Z.F. and Long, Y.-T.\* (corresponding author) (2011): A Multi-channel Sensor Based on 8-Hydroxyquinoline Ferrocenoate for Probing Hg(II) ion. *Talanta*, DOI:10.1016/j.talanta.2011.02.024.
7. Song, W.; Li, D. W.; Li, Y. and Long, Y.-T.\* (corresponding author) (2011): Disposable biosensor based on graphene oxide conjugated with tyrosinase assembled gold nanoparticles, *Biosensors & Bioelectronics*. 26:3181-3186.
8. Li, D.; Li, D.W.; Fossey, J.S. and Long, Y.-T.\* (corresponding author) (2011): In-situ surface-enhanced Raman scattering and X-ray photoelectron spectroscopic investigation of coenzyme Q<sub>10</sub> on silver electrode. *Phys. Chem. Chem. Phys.* 13:2259-2265.
9. Ying, Y.L.; Wang, H.Y.; Sutherland, T. and Long, Y.-T.\* (corresponding author) (2011): Monitoring of an ATP-Binding Aptamer and its Conformational Changes using an  $\alpha$ -Hemolysin Nanopore, *Small (front cover)*. 7(1):87-94.
10. Li, Y.; Shi, L.; Ma, W.; Kraatz, H. B.\* and Long, Y.-T.\* (corresponding author) (2011): 6-Vinyl Coenzyme Q<sub>0</sub>: Electropolymerization and Electrocatalysis of NADH Oxidation Exploiting poly-*p*-Quinone-modified Electrode Surfaces, *Bioelectrochemistry*, 80:128-131.
11. Li, D.; Li D.W.; Fossey, J.S. and Long, Y.T.\* (corresponding author) (2010): Portable Surface-Enhanced Raman Scattering Sensor for Rapid Detection of Aniline and Phenol Derivatives by On-Site Electrostatic Preconcentration. *Anal. Chem.* 82:9299-9305.
12. Tang, J.; Hua, J. L.; Wu, W.; Li, J.; Jin, Z.G.; Long, Y.-T. and Tian, H. (2010): New starburst sensitizer with carbazole antennas for efficient and stable dye-sensitized solar cells. *Energy*

*Environ. Sci.*, 3:1736-1745.

13. Wang, H.Y.; Ying, Y.L.; Li, Y. and Long, Y.-T.\* (corresponding author) (2010): Peering into Biological Nanopore: A Practical Technology to Single Molecule Analysis, *Chemistry - An Asian Journal*, 5:1952-1961.
14. Song, S.-X.; Zhang, H.-L.; Kim, C.-G.; Sheng, L.; He, X.-P.; Long, Y.-T.; Li, J.; Chen and G.-R. (2010): Expeditious Preparation of Triazole-linked Glycolipids via Microwave Accelerated Click Chemistry and Their Electrochemical and Biological Assessments. *Tetrahedron*, 66:9974-9980.
15. Li, D. W.; Li, Y.T.; Song, W. and Long Y.-T.\* (corresponding author) (2010): Simultaneous determination of dihydroxybenzene isomers using disposable screen-printed electrode modified by multiwalled carbon nanotubes and gold nanoparticles. *Anal. Methods*, 2:837-843.
16. Kong, C.; Qin, L. X.; Liu, J.F.; Zhong, X.H., Zhu, L.Y. and Long, Y.-T.\* (corresponding author) (2010): Determination of dissolved oxygen based on photoinduced electron transfer from quantum dots to methyl viologen. *Anal. Methods*, 2:1056-1062.
17. Liu, Q.; Li, Y.; Zhang, L.Y.; Li, D.\* (corresponding author); Fan, C. H. and Long, Y.-T.\* (corresponding author) (2010): *Electroanalysis*, 22: 2862-2870.
18. Li, D.; Li, D.-W.; Li, Y.; Fossey, J. S. and Long Y.-T.\* (corresponding author) (2010): Cyclic electroplating and stripping of silver on Au@SiO<sub>2</sub> core/shell nanoparticles for sensitive and recyclable substrate of surface-enhanced Raman scattering, *J. Mater. Chem.*, 20, 3688-3693.
19. Zhang, L.; Song, W.; Shi, L.; Li, D.W. and Long, Y.-T.\* (corresponding author) (2010): High sensitive on-site Cadmium sensor based on AuNPs amalgam modified screen-printed carbon electrodes, *IEEE Sensors J.*; 10:1583-1588.
20. Song, W.; Zhang, L.; Shi, L.; Li, D.-W. and Long, Y.-T.\* (corresponding author) (2010): Investigation on determination of quinol in water samples using gold nanoparticle modified screen printed electrodes, *Chinese Enviro. Chem.*, 29:132-136.
21. Zhu, C.F.; Wen, Y.Q.; Peng, H.Z.; Long, Y.-T.; He, Y.; Huang, Q.; Li, D. and Fan, C.F. (2010): A methylation-stimulated DNA machine: an autonomous isothermal route to methyltransferase activity and inhibition analysis. *Anal. Bioanal. Chem.*, DOI 10.1007/s00216-010-4137-2.
22. Zhang, L.; Shi L.; Song, W. and Long, Y.-T.\* (corresponding author) (2010): Immobilization of Myoglobin with Regenerated Silk Fibroin/MWCNTs on Screen-Printed Electrode: Direct Electrochemistry and Electrocatalysis of H<sub>2</sub>O<sub>2</sub>. *Nanostructured Materials and Systems: Ceramic Transactions, Volume 214* (eds Mathur, S.; Shen H. and Singh M.), John Wiley & Sons, Inc., Hoboken, NJ, USA. doi: 10.1002/9780470909812.ch8
23. Cheng L.Y.; Long, Y.T.\* (corresponding author); Tian, H.; and Kraatz, H. B. (2010): Spectroscopic and Electrochemical Investigations into the Interactions of Metal Ions with a Ferrocenoyl-Histidine Peptide Conjugate. *Eur. J. Inorg. Chem.* ,5231-5238.
24. Song, W.; Zhang, L.; Shi L.; Li, D. W.; Li, Y. and Long, Y.-T.\* (corresponding author) (2010): Simultaneous determination of cadmium(II), lead(II) and copper(II) by using a screen-printed electrode modified with mercury nano-droplets. *Microchim. Acta*, 169:321-326.
25. Zhao, X.C.; Zhang, M.-N.; Long, Y.-T. and Ding, Z.F. (2010): Redox reactions of reactive oxygen species in aqueous solutions as the probe for scanning electrochemical microscopy of single live T24 cells. *Can. J. Chem.*, 88: 569-576.
26. Wen, Y.Q.; Xing, F.F.; He, S.J.; Song, S. P.; Wang, L. H.; Long, Y.-T.; Li, D. and Fan, C.H. (2010): A graphene-based fluorescent nanoprobe for silver(I) ions detection by using graphene oxide and a silver-specific oligonucleotide. *Chem. Commun.*, 46: 2596-2598.

27. Wu, W.; Yang, J.B.; Hua, J. L.; Tang, J.; Zhang, L.; Long, Y.-T. and Tian, H. (2010): Efficient and stable dye-sensitized solar cells based on phenothiazine sensitizers with thiophene units. *J. Mater. Chem.*, 20:1772-1779.
28. Qu, S.; Wu, W.; Hua, J. L.; Kong, C.; Long, Y.-T. and Tian, H. (2010): New Diketopyrrolopyrrole (DPP) Dyes for Efficient Dye-Sensitized Solar Cells, *J. Phys. Chem. C* 114:1343-1349.
29. Long, Y.-T.\*(corresponding author) and Zhang, M.-N., (2009): Self-assembling Bacterial Pores as Components of Nanobiosensors for the Detection of Single Peptide Molecules, *Sci. in China Series B: Chem.*, 52 (6): 731-733.
30. Wang, J.; Long, Y.-T.; Zhang, Y. L.; Zhong, X. H. and Zhu, L.Y., (2009): Preparation of Highly Luminescent CdTe/CdS Core/Shell Quantum Dots, *ChemPhysChem*;10(4), 680-685.
31. Zhu, C.F.; Song, S. P.; Wang, L. H.; Long, Y.-T. and Fan, C.H. (2008): Design of a Gold Nanoprobe for Rapid and Portable Mercury Detection with the Naked Eye, *Chem. Commun.*; 4885-4887.
32. Liu, G. L.\*; Long, Y.-T.\*; Choi, Y.; Kang, T. and Lee, L.P. (\*co-first author) (2007): Quantized Plasmon Quenching Dips Nanospectroscopy via Plasmon Resonance Energy Transfer, *Nature Methods*; 1015-1017.
33. Dey, S. K.; Long, Y.-T.; Chowdhury, S.; Sutherland, T. C.; Mandal, H. S. and Kraatz, H.-B. (2007): Study of electron transfer in ferrocene-labeled collagen-like peptides. *Langmuir*; 23, 6475-6477.
34. Mohammad, A. K.; Long, Y.-T.; Schatte, G. and Kraatz, H.-B. (2007): Surface Studies of Aminoferrocene Derivatives on Gold: Electrochemical Sensors for Chemical Warfare Agents, *Anal. Chem.*; 79 (7): 2877-2884.
35. Long, Y.-T. and Kraatz, H. B. (2006): "Charge Transport in Biological Molecules" in *Concepts and Models in Bioinorganic Chemistry* (eds. Kraatz, H.B. & Metzler-Nolte, N., ISBN 3-527-31305-2 Wiley-VCH, Weinheim.
36. Appoh, F. E.; Long, Y.-T. and Kraatz, H.-B. (2006): Study of Peptide Dendrimers Having a Ferrocene Core Supported on Mercaptoundecanoic Acid. *Langmuir*; 22(25) 10515-10522.
37. Stefureac, R.; Long, Y.-T.; Howard and P.; Lee, J. S. (2006): Transport of  $\alpha$ -Helical Peptides through  $\alpha$ -Hemolysin and Aerolysin Pores. *Biochemistry*; 45, 9172-9179.
38. Long, Y.-T., Abu-Irhayem, E. and Kraatz, H.-B. (2005): Peptide electron transfer: More questions than answers, *Chem. Eur. J.*, 11(18), 5186-5194. (selected as cover)
39. Orłowski, G. A., Chowdhury, S.; Long, Y.-T.; Sutherland, T. C. and Kraatz, H.-B. (2005): Electrodeposition of Ferrocenoyl Peptide Disulfides. *Chem. Commun.*, 1330-1332.
40. Mahmoud, K. A.; Long, Y.-T.; Schatte, G. and Kraatz, H.-B. (2005): Rearrangement of the active ester intermediate during HOBt/EDC amide coupling. *Eur. J. Inorg. Chem.* 173-180.
41. Long, Y.-T., Sutherland, T. C., Kraatz, H.-B. and Lee, J. S. (2004): Photoinduced production of NAD(P)H from an activated fluorescein-DNA monolayer, *Chem. Commun.*, 2032-2033.
42. Long, Y.-T., Li, C.-Z., Sutherland, T. C., Kraatz, H.-B. and Lee, J. S. (2004): Electrochemical Detection of Single-Nucleotide Mismatches: Application of M-DNA, *Anal. Chem.* 76, 4059-4065.
43. Sutherland, T. C., Long, Y.-T., Li, Kraatz, H.-B. and Lee, J. S. (2004): Structure of peptides investigated by nanopore analysis, *Nano Letts*, 4(7), 1273-1277.
44. Li, C.-Z., Long, Y.-T., Kraatz, H.-B. and Lee, J. S. (2004): Protein-DNA Interaction: Impedance

- Study of MutS Binding to a DNA Mismatch. *Chem. Commun.*, 574-575.
45. Mahmoud, K., Long, Y.-T., Schatte, G. and Kraatz, H.-B. (2004): Electronic Communication through the Ureylene Bridge: Spectroscopy, Structure and Electrochemistry of dimethyl 1',1'-ureylenedi(1-ferrocenecarboxylate), *J. Organometallic Chem.* **689(13)**, 2250-2255.
  46. Kraatz, H. B., Long, Y.-T. and Sutherland, T. C. (2004): "Metal-Labeled DNA on Surfaces" in *Macromolecules Containing Metal and Metal-like Elements* (eds. Abd-El-Aziz, Carraher, Pittman, Sheats & Zeldin) John Wiley and Sons, Inc., New York.
  47. Long, Y.-T., Li, C.-Z., Sutherland, T. C. Chahma, M. Kraatz, H.-B. and Lee, J. S. (2003): A Comparison of Electron Transfer Rates of Ferrocenoyl Linked DNA. *J. Am. Chem. Soc.* **125(29)**, 8724-8725.
  48. Long, Y.-T., Li, C.-Z., Kraatz, H.-B. and Lee, J. S. (2003): AC Impedance Spectroscopy of Native DNA and M-DNA. *Biophys. J.*, **84(5)**, 3218-3225.
  49. Li, C.-Z., Long, Y.-T., Kraatz, H.-B. and Lee, J. S. (2003): Electrochemical Investigations of M-DNA Self-Assembled Monolayers on Gold Electrodes. *J. Phys. Chem. B*, **107(10)**, 2291-2296.
  50. Wettig, S.-D., Li, C.-Z., Long, Y.-T., Kraatz, H.-B. and Lee, J. S. (2003): M-DNA: a Self-Assembled Molecular Wire for Nanoelectronics and Biosensing. *Anal. Sci.* **19(1)**, 23-26.
  51. Long, Y.-T., Herrwerth, S., Eck, W. and Grunze, M. (2002): Syntheses and Characterization of self-assembled monolayers based on redox-active silane compound on platinum surface. *Phys. Chem. Chem. Phys.* **4(3)**, 522-526.
  52. Long, Y.-T., Rong, H.-T., Buck, M. and Grunze, M., (2002): Odd-even effects in the cyclic voltammetry of biphenyl based thiols. *J. Electroanal. Chem.* **524-525**, 62-67.
  53. Long, Y.-T., Yu, Z.-H. and Chen, H.-Y. (1999): Determination of Coenzyme Q10 by in situ EPR Spectroelectrochemistry. *Electrochem. Commun.* **1(5)**, 194-196.
  54. Chen, H.-Y. and Long, Y.-T. (1999): Study of Biomolecules by Combining Electrochemistry with UV/Vis, IR and Surface Enhanced Raman Scattering Spectroscopy by a Novel Flow Microcell. *Anal. Chim. Acta*, **382(1-2)**, 171-177.
  55. Long, Y.-T., Zhu, J.-J. and Chen, H.-Y. (1998): Preconcentration and Voltammetric Determination of Trace Myoglobin at a 6-Mercaptopurine Modified Silver Electrode. *Fresenius' J. Anal. Chem.* **360(5)**, 614-617.
  56. Long, Y.-T. and Chen, H.-Y. (1997): Electrochemical Regeneration of Coenzyme NADH on Histidine Modified Electrode. *J. Electroanal. Chem.* **440(1-2)**, 239-242.
  57. Long, Y.-T., Zou, J. and Chen, H.-Y. (1997): Electrocatalytic Oxidation and Flow Detection of NAD(P)H at Histidine Modified Silver Electrode. *Anal. Letts.* **30(15)**, 2691-2703.
  58. Ma, Y.-J., Li, G., Long, Y.-T. and Zhu, S. (1997): Electrochemical coordinate reaction mechanism of nicotinamide adenine nucleotide on silver electrode by ultraviolet spectroelectrochemistry. *J. Inorg. Chem.* **13**, 200-206 (in Chinese)
  59. Li, G., Long, Y.-T., Chen, H.-Y. and Zhu D.-X. (1996): Determination of Trace Hemoglobin by Square Wave Stripping Voltammetry at a Microelectrode. *Fresenius' J. Anal. Chem.* **356(5)**, 359-360.
  60. Li, G., Fang, H., Long, Y.-T. and Chen H.-Y. (1996): L-Cysteine Modified Silver Electrode and Its Application to the Study of the Electrochemistry of Hemoglobin. *Anal. Letts.* **29**, 1273-1280.
  61. Zou, S. F.; Long, Y.-T. and Liang, W.A.. (1993): Determination of stability constant of unstable complex by dissociation degree ratio method. *Fenxi Huaxue* **21(5)**, 514-18.

## **INVITED SEMINARS**

1. “Nanoscopic Biomolecular Spectroscopy Enabled by Single Nanoparticle Plasmon Resonance Energy Transfer” Invited seminar, **The University of West Ontario, Canada, 2008**, Feb.
2. “Biointerphase Science: From DNA to Peptides” Invited seminar, **Lawrence Berkeley National Laboratory, Berkeley, USA. 2006**, September.
3. “Toward Nanopore & Biointerfaces.” Invited seminar, **University of Alberta, Edmonton, Canada, 2006**, February.
4. “Nanopore: Single Molecule Analysis.” Invited seminar, **University of British Columbia, Vancouver, Canada, 2004**, December.

## **PATENTS**

1. Chen, H-Y., Long, Y.-T., Zou J. and Yu, Z.H. “Spectroelectrochemical flow microcell ” **CN 01237524.1**.
2. Long, Y.-T., Li, C.-Z, Kraatz H. B. and Lee, J. S. “DNA mismatch detection by electrochemical AC impedance spectroscopy” (2004), **WO 2004079001**.
3. Li, C-Z., Long, Y.-T., Kraatz, H. B., Lee, J. S. Electrochemical detection of DNA binding. PCT Int. Appl. (2005), **WO 2005001122**.
4. Long Y.-T., Sutherland, T. C., Kraatz, H.-B. and Lee, J. S. “Photocurrent generator” (2005), **WO 2005023413**.
5. Anj Braske, Sutherland, T. C., Long Y.-T. and Lee J. S., “Small volume electrochemical analysis system” (2005) **WO 2005088291**.
6. Long, Y.-T., Li, C.-Z, Kraatz H. B. and Lee, J. S. Electrochemical detection of SNP in DNA by using AC impedance spectroscopy. (2006) **US. 2006275786**.
7. Sutherland, T. C., Long Y.-T., and Lee, J. S. “Electrophoretic pathogen detector” **US**. Filed in May. **2004**.
8. Lee, P. L., Liu, G., and Long Y.-T., “Integrated Nanoscopic Bimolecular Imaging System Enabled by Single Nanoparticle Plasmon Resonance Energy Transfer. (2008) **WO 2008140754**.
9. Long, Y.T., Ma W. and Shi L., Synthesis of Coenzyme Qs Homologues, (2008) **CN 2008356278**.

## **AWARDS**

- 1995** Guanghua Scholarship, Nanjing University, P. R. CHINA  
**1997** National Outstanding Graduate Student Award, Nanjing University, P. R. CHINA  
**1998** Guanghua Scholarship, Nanjing University, P. R. CHINA  
**1999** DAAD Scholarship, GERMANY  
**2000** French CNRS Research Fellowship, FRANCE  
**2000** First National Higher-Learning School Scientific and Technological Prize, P.R.CHINA  
**2001** Health Services Utilization and Research Commission (HSURC) Research Award, Saskatchewan, CANADA  
**2007** Shanghai Shuguang Scholar, CHINA  
**2009** Shanghai Pujing Project, CHINA  
**2009** Shanghai Eastern Scholar, CHINA

**2010** Excellent DONGYUE Teaching Award, SHANGHAI

### **TRAINED AND SUPERVISED PERSONEL**

Total 18 master students, 2 in University of Alberta (2006), 16 in ECUST (2007-2011)

Total 12 Ph.D. students, 3 in University of Saskatchewan (2003-2006), 1 in Berkeley (2006), 12 in ECUST(2007-2014)

Total 2 Postdoctoral fellows, 2 in University of Saskatchewan (2004-2005), 1 in ECUST (2007-2010)

### **FUNDING SUPPORT**

2007~2010 Shanghai Shuguang Program Grant (07SG36, **¥ 150,000**)

2008~2011 National High Technology Research and Development Program of China  
(**863** Program, 2008AA06A406, **¥ 10,580,000**)

2008~2011 National Science Foundation of China  
(**NSFC** 20875030, **¥ 320,000**)

2009~2011 Shanghai Pujiang Program Grant (09PJ1403300, **¥ 200,000**)

2008-2012 Key Research Plan of China Ministry of Health  
(2009 ZX 10004-301, **¥ 500,000**)

2009~2012 The Program for Professor of Special Appointment in Shanghai  
(Eastern Scholar, **¥ 700,000**)

2008~2011 Excellent Research Project for ECUST (**¥ 2,000,000**)

2010~2013 The Fundamental Research Funds for the Central Universities  
(WK1013002, **¥ 500,000/year**)

2010 Intellectual Ventures for SELECT INVENTOR (USD **30,000**)

2011~2013 Major Research Plan of National Science Foundation of China  
(**NSFC** 91027035, **¥ 600,000**)