Liaohai Leo Chen

Personal data

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Education

Postdoc 1997 - 1999 Biophysics, Los Alamos National Laboratory, NM

Ph.D 1995 - 1997 Organic Chemistry, University of Rochester, NY

M.S. 1993 - 1995 Organic Chemistry, University of Rochester, NY

B.S. 1983 - 1987 Chemistry, Zhejiang University, China

Research and Professional Experience

Molecular Biologist and Group Leader for Nano-Bio, 2/2005 ---
Biosciences Division, Argonne National Laboratory

Associate Professor, 7/2006 ---
Rush University Medical Center

Assistant Molecular Biologist, 6/2001-2/2005
Biosciences Division, Argonne National Laboratory

Adjunct Faculty, 11/2004 --- 06/2006
Rush University Medical Center

Technical Staff Member, 12/1999-6/2001
Bioscience Division, Los Alamos National Laboratory.

Research Associate, 10/1987 - 08/1993
Dalian Institute of Chemical Physics, Chinese Academy of Science

Recent Synergy Activities:

Review Panel for NSF Materials Research Science and Engineering Center, November, 2007

Panel for NIH blue print on human embryonic stem cells June, 2007

Committee for Argonne National Laboratory director competitive grant 2005-2007;

Panel for University of Chicago and Argonne seed grant; 2007-

Panel Member of RAC Imaging Working Groups for strategic planning of an Imaging Institute at University of Chicago, August, 2007;

Active reviewer for journals of Langmuir, JACS, Biophysics Journal, Analytical Biochemistry, etc.

Current Research Topics:

- Enabling tool development for Interventional Biology including in vivo biophysics, high throughput biology at single molecular level; molecular proteomics at single cell level;
- Interventional Biology for embryonic stem cell and cancer stem cells
- Functional nanoparticles based on hybrid phage and their application as probes/tracers/carriers for molecular imaging and therapeutics;
- Microfluidic digital PCR for single cell genetic analysis from cell community;
- Nanomaterials for scaffolding and interfering stem cells;
- Bio-templated nano-hole array and Hole Enhanced Raman Scattering (HERS) for biology molecule characterization ;
- Synthetic Biology: Synthesize artificial protocells;
- Synchrotron imaging and spectroscopy (such as x-ray fluorescence microscopy- *see also metalloproteomics*)

Publications

(Peer reviewed)

Fouzi Mouffouk, Yasmin Chishti, Qiaoling Jin, Michelle E. Rosa, Melixa Rivera, Siva Dasa and Liaohai Chen "Polymeric micelle-based bioassay with femtomolar sensitivity" *Analytic Biochemistry*, 2008, 372, 140.

John Bahns, A. Imre, V. K. Vlasko, Liaohai Chen, U. Welp Enhances Raman scattering from focused surface plasmons. *Applied Physics Letters*, 2007, 91, 081104.

Axel Hoffmann, Seok-Hwan Chung, Samuel D. Bader, Lee Makowski, and Liaohai Chen Brownian Motion in Biological Sensing in: Biomedical Applications of Nanotechnology, edited by Vinod Labhasetwar and Diandra L. Leslie Pelecky, (Wiley, New York, 2007), p. 83–103

Seok-Hwan Chung, Axel Hoffmann, Liaohai Chen, Shouheng Sun, Konstantin Guslienko, Marcos Grimsditch, and Samuel D. Bader, Substrate-free Biosensing using Brownian Rotation of Bio-conjugated Magnetic Nanoparticles, *Journal of Magnetics* 2006, 11(4), 189-194.

John T. Bahns, Funing Yan, Dengli Qiu, Rong Wang and Liaohai Chen "Hole-Enhanced Raman Scattering" *Applied Spectroscopy*, 2006, 60, 989-993(5).

Yuexing Zhang, John T. Bahns, Qiaoling Jin, Ralu Divan, and Liaohai Chen **"**Towards the Detection of Single Virus Particle in Serum", *Analytic Biochemistry*, 2006, 356, 161-170.

PASCALE EHRENFREUND, STEEN RASMUSSEN, JAMES CLEAVES and LIAOHAI CHEN "Experimentally tracing the Key steps in the origin of Life: The Aromatic World", *ASTROBIOLOGY*, 2006, Vol. 6, No. 3: 490-5203.

Chinmei Liu, Seok-Hwan Chung, Qiaoling Jin, April Sutton, Funing Yan, Axel Hoffmann, Brian K. Kay, Samuel D. Bader, Lee Makowski and Liaohai Chen "Magnetic viruses via nano-capsid templates"**,** *Journal of Magnetism and Magnetic Materials*, **2006**, 302, 47-51.

S.-H. Chung, A. Hoffmann, K. Guslienko, S. D. Bader, C. Liu, B. Kay, L. Makowski, and L. Chen**,** Biological sensing with magnetic nanoparticles using Brownian relaxation (invited), *J. Appl. Phys.* 2005, **97**, 10R101.

Chin-Mei Liu, Qiaoling Jin, April Sutton, and Liaohai Chen, A novel fluorescent probe: Europium complex hybridized T7 phage, *Bio-conjugation Chem.* **2005**, 16, 1054 -1057.

K. E. Achyuthan, T. S. Bergstedt, L. Chen, R. M. Jones, S. Kumaraswamy, S. A. Kushon, K. D. Ley, L. Lu, D. McBranch, H. Mukundan, F. Rininsland, X. Shi, W. Xia and D. G. Whitten Fluorescence superquenching of conjugated polyelectrolytes: applications for biosensing and drug discovery *Journal of Materials Chemistry*, 2005, 15, 2648–2656.

S.-H. Chung, A. Hoffmann, K. Guslienko, S. D. Bader, C. Liu, B. Kay, L. Makowski, and L. Chen**,** Biological sensing with magnetic nanoparticles using Brownian relaxation (invited), *J. Appl. Phys.* 2005, **97**, 10R101.

Qiling Tang, Yuexing Zhang, Liaohai Chen, Funing Yan and Rong Wang Protein delivery with nanoscale precision *Nanotechnology* (2005) **16** 1062-1068.

Dalvi-Malhotra, J.; Chen, Liaohai Enhanced Conjugated Polymer Fluorescence Quenching by Dipyridinium-Based Quenchers in the Presence of Surfactant *J. Phys. Chem. B. ;* 2005**;** *109*(9); 3873-3878.

Funing Yan, Qiling Tang, Rong Wang, and Liaohai Chen, "Synthesis and characterization of a photo-cleavable cross-linker and its application on tunable surface modification and protein photo-delivery", *Bio-conjugation Chem.* 2004, 15,1030-1036.

John T. Bahns, Chin-Mei Liu, and Liaohai Chen, "Characterizing specific phage-protein interactions by fluorescence correlation spectroscopy" *Protein Science* 2004, 13, 2578-2587.

S. H. Chung, A. Hoffmann and S. D. Bader, C. Liu, B. Kay and L. Makowski and Liaohai Chen, "Biological sensors based on Brownian relaxation of magnetic nanoparticles" *Apply Phys. Lett.*, 2004, 85, 2971-2973.

Rong Wang, Jeane Shi, Atul N. Parikh, Andrew P. Shreve, Liaohai Chen and Basil I. Swanson "Evidence for cholera aggregation on GM1-decorated lipid bilayers", *Colloids and Surfaces B: Biointerfaces,* 2004 (33) 45-51

Steen Rasmussen, Liaohai Chen, Barbel Stadler and Peter Stadler, "Proto-organism kinetics: evolutionary dynamics of lipid aggregates with gene and metabolism", *Origins of Life and Evol. of The Biosp. 2004 (34), 171.*

Steen Rasussen, Liaohai Chen, David Deamer, David Krakauer, Norman Packard, Peter Stadler and Mark Bedau "Transitions from nonliving to living Matter" *Science* 2004 (303), 963-965.

Steen Rasmussen ; Liaohai Chen ; Martin Nilsson ; Shigeaki Abe, "Bridging Nonliving and Living Matter", *Artificial Life*, 2003 (9), 3, 269 – 316.

Shigeaki Abe and Liaohai Chen, "Tuning the photophysical properties of an ionic conjugated polymer through interaction with polyelectrolytes", *J. Polymer science: Part B: polymer physics,* 2003 (41), 1676-1679.

Hsing-lin Wang, Duncan McBranch, Liaohai Chen, Fred Wudl "Highly efficient energy and charge transfer in thin self-assembled mutilayered polymer films" *Synthetic Metals*, (2001), 121, 1367.

Liaohai Chen, Su Xu, Duncan McBranch, and David Whitten "Tuning the Properties of Conjugated Polyelectrolytes Through Surfactant Complexation" *J. Am. Chem. Soc.* (2000), 122, 9302-9303.

Liaohai Chen, Rong Wang, Duncan McBranch, and David Whitten "Surfactant-Induced Modification of Quenching of Conjugated Polymer Fluorescence by Electron Acceptors: Applications for Chemical Sensing" *Chem. Phy. Lett.* (2000), 330, 27-33.

Rong Wang, Cristina Geiger, Liaohai Chen, Basil Swanson, David G. Whitten "Direct Observation of Sol-Gel Conversion: the Role of the Solvent in Organogel Formation" *J. Am. Chem. Soc.* (2000), 122(10), 2399-2400.

Liaohai Chen, Cristina Geiger, Jerry Perlstein and David G. Whitten "Self-Assembly of Styryl Naphthalene Amphiphiles in Aqueous Dispersions and Interfacial Films: Aggregate Structure, Assembly Properties, Photochemistry and Photophysics*" J. Phys. Chem. B* (1999), 103(43), 9161-9167.

Cristina Geiger, Marina Stanescu, Liaohai Chen, and David G. Whitten Organogels Resulting from Competing Self-AssemblyUnits in the Gelator: Structure, Dynamics, and Photophysical Behavior of Gels Formed from Cholesterol-Stilbene and Cholesterol-Squaraine Gelators, *Langmuir (*1999)**,** *15,* 2241-2245.

Liaohai Chen, Duncan W. McBranch, Hsing-Lin Wang, Roger Helgeson, Fred Wudl, and David G. Whitten "Highly-Sensitive Biological and Chemical Sensors Based on Reversible Fluorescence Quenching in a Conjugated Polymer" " *Proc. Nat. Acad. Sci.* (1999), 22, 12287-12292.

Whitten, David G.; Liaohai Chen; Geiger, H. Cristina; Perlstein, Jerry; Song, Xuedong. "Self-Assembly of Aromatic-Functionalized Amphiphiles: The Role and Consequences of Aromatic-Aromatic Noncovalent Interactions in Building Supramolecular Aggregates and Novel Assemblies" Feature Article *J. Phys. Chem. B* (1998), 102(50), 10098-10111.

Liaohai Chen; Lucia, Lucian A.; Gaillard, E. R.; Whitten, David G.; Icil, H.; Icli, S. "Photooxidation of a Conjugated Diene by an Exciplex Mechanism: Amplification via Radical Chain Reactions in the Perylene Diimide-Photosensitized Oxidation of α-Terpinene" *J. Phys. Chem. A* (1998), 102(45), 9095-9098.

Lucia, Lucian A.; Wyrozebski, Kataryna; Liaohai Chen; Geiger, Cristina; Whitten, David G. **"**Electron Transfer Photofragmentation Reactions in Monolayer Films at the Air/Water Interface" *Langmuir* (1998), 14(13), 3663-3672.

Liaohai Chen; Lucia, Lucian; Whitten, David G. **"**Cooperative Electron Transfer Fragmentation Reactions. Amplification of a Photoreaction through A Tandem Chain Fragmentation of Acceptor and Donor Pinacols" *J. Am. Chem. Soc*. (1998), 120(2), 439-440.

Liaohai Chen; Farahat, Mohammad S.; Gaillard, Elizabeth R.; Farid, Samir; Whitten, David G. **"**Photoinduced Electron Transfer Double Fragmentation: an Oxygen-Mediated Radical Chain Process in the Co-fragmentation of Substituted Pinacol Donors with Carbon Tetrachloride" *J. Photochem. Photobiol., A* (1996), 95(1), 21-5.

Liaohai Chen; Farahat, Mohammad S.; Gan, Hong; Farid, Samir; Whitten, David G. **"**Photoinduced Electron Transfer Double Fragmentation: An Oxygen-Mediated Radical Chain Process in the Cofragmentation of Aminopinacol Donors with Organic Halides" *J. Am. Chem. Soc*. (1995), 117(23), 6398-6399.

Liaohai Chen, Wanzhen Gu et al. " Highly Efficient Hydrogen and Ethylene Glycol Photoproduction From Aqueous Methanol Solution by ZnS and an in Situ Spin Trapping Investigation " *J. Photochemistry and Photobiology: A. Chem*: (1993), 74, 85-89.

Liaohai Chen, Wanzhen Gu et al. " Photoproduction of Hydrogen and 1,2-Propanediol From Aqueous Methanol and Ethanol Solution Catalyzed by ZnS " *J. Photochemistry and Photobiology: A. Chem*: (1993), 73, 217-220.

Patents

Liaohai Chen "AN IMPROVED METHOD FOR THE USE OF CA 125 FOR OVARIAN CANCER DIAGNOSIS" Patent disclosure (ANL-IN-07-005), provisional patent was filed October, 2007.

Liaohai Chen "Polymeric micelle-based bioassay with femtomolar sensitivity" Patent disclosure (ANL-IN-07-006), provisional patent was filed November, 2007..

Liaohai Chen, A. Hoffmann, S. D. Bader, B. Kay and L. Makowski **"**Inorganic hybridized phage" US patent filed March 21, 2005

Chen, Liaohai "Enhanced photophysics of conjugated polymers" US patent (*2003) 0224525*.

Chen, Liaohai; Xu, Su; McBranch, Duncan; Whitten, David. "Enhanced photophysics of conjugated polymers, complex with surfactants, their manufacture and fluorescent propertie" U.S. Patent (2003) 6569952.

Chen, Liaohai, "Tuning the properties of ionic conjugated polymer with polyelectrolytes and application in a biosensor platform". Patent number WO (2002) 2002079268.

Chen, Liaohai; McBranch, Duncan W.; Wang, Hsing-Lin; Whitten, David G. "Method for detecting biological agents". Patent number WO (2000) 2000066790. The patent has led to the establishment of QTL Biosystems at Santa Fe, New Mexico and the sensor device was the candidate for 2000 R&D 100 award.

Book Chapter

Axel Hoffmann, Seok-Hwan Chung, Samuel D. Bader, Lee Makowski and Liaohai Chen, Chapter 1, BROWNIAN MOTION IN BIOLOGICAL SENSING. *BIOMEDICAL APPLICATIONSOF NANOTECHNOLOGY,* A JOHN WILEY & SONS, INC., 2005

David Whitten, **Liaohai Chen**, Robert Jones, and Peter Heeger Chapter 4: From Superquenching to biodetection: Building sensors based on fluorescent polyelectrolytes *Optical Sensors and Switches,* Marcel Dekker, Inc. 2001.

Research Support

Ongoing Research Support from Federal Funding Agencies

R01 NS47719-01A (Liaohai Chen, PI) Period: 12/2004 – 12/2008

Agency: National Institutes of Health
"Nanotechnology for System Biology of Stem Cells"
The goal of this project is to use high throughput biology tools to quickly map protein-protein interactions of the proteins, which may play a role in controlling the proliferation and differentiation for the neural stem cells..
Role:PI

Completed Research Support

U54 AI057153-01 (Liaohai Chen PI) Period: 09/04/03-08/31/06
Agency: National Institutes of Health
"Early Detection of Hemorrhagic Fevers: Affinity Imprinting for Hemorrhagic Virus"
The objective of this developmental project of the Regional Center of Excellence (RCE) is development of a new methodology of affinity imprinting to make early detection of hemorrhagic fevers possible.
Role: PI

8C674-00 BioMagneticIC program (Liaohai Chen) Period: 03/01/03-2/28/06
Agency: Defense Advanced Research Projects Agency
"Sensors based on resonant oscillation of magnetic phage with high affinity and specificity for target molecules"
Develop novel biological sensing platform based on detecting changes in dynamic magnetic properties of ligand-displayed magnetic phage viruses.
Role: PI.