

Curriculum Vitae

Xiaogang Liu

Associate Professor
National University of Singapore
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Senior Scientist
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RESEARCH INTERESTS

Supramolecular coordination chemistry, catalysis, nanomaterials synthesis and nanostructure patterning, chemical sensors and biosensors, nanophotonics, scanning probe microscopes.

ACADEMIC APPOINTMENTS

July 2011 Associate Professor, Department of Chemistry
National University of Singapore

January 2011 Senior Scientist, Institute of Materials Research and Engineering
Agency for Science, Technology and Research

Dec 2006 – June 2011 Assistant Professor, Department of Chemistry
National University of Singapore

Sept 2004 – Nov 2006 Postdoctoral Fellow, Department of Materials Science and Engineering
Institute of Technology (with Professor Francesco Stellacci)

EDUCATION

Sept 2004 Ph.D., Inorganic Chemistry (with Professor Chad A. Mirkin)
Northwestern University, Evanston, Illinois, U.S.A.
“Synthesis, Reactivity, and Molecular Recognition Studies of a New Class of Metallocyclophanes”

Sept 1999 M.S., Chemistry (with Professor John W. Sibert)
East Carolina University, Greenville, North Carolina, U.S.A.
“Wurster’s Cryptands: A New Class of Redox-Active Macrocycles”

1992 -1996 B.Eng., Chemical Engineering
Beijing Technology and Business University, Beijing, China

AWARDS AND HONORS

Chemical Society Reviews Emerging Investigator Lectureship Award (RSC **2012**)
Taiwan National Science Council Lectureship Award (**2012**)
University Young Researcher Award (NUS **2011**)

BASF-SNIC Award in Materials Chemistry (2011)
JSPC Scientist Exchange Program (2010)
Department of Chemistry Young Chemist Award (NUS 2009)
Faculty of Science Young Scientist Award (NUS 2008)
Young Investigator Award (NUS 2006)
Materials Day Best Poster Presentation (MIT 2006)
Materials Research Society Outstanding Graduate Student Award (Northwestern 2002)
Omicron Delta Kappa (East Carolina 1999)
Burroughs Wellcome Fund Fellowship in Synthetic Organic Chemistry (East Carolina 1998)

PROFESSIONAL ACTIVITIES AND AFFILIATIONS

Editorial Board: *Nanoscale*

Book series editor: RSC *Nanoscience and Nanotechnology*

Manuscript reviews for: *Advanced Materials*, *Advanced Healthcare Materials*, *Advanced Functional Materials*, *ACS Nano*, *Analytical Chemistry*, *Angewandte Chemie*, *Applied Physics B*, *Applied Surface Science*, *Biomaterials*, *Biosensors & Bioelectronics*, *Catalysis Today*, *ChemPhyChem*, *Chemical Reviews*, *Chemical Science*, *Crystal Engineering Design*, *Coordination Chemistry Reviews*, *CrystEngComm*, *Dalton Transaction*, *Environmental Science & Technology*, *European Journal of Organic Chemistry*, *Inorganic Chemistry*, *IEEE Sensors*, *Journal of the American Chemical Society*, *Journal of Alloys and Compounds*, *Journal of Materials Chemistry*, *Journal of Organic Chemistry*, *Journal of Physical Chemistry*, *Journal of Physical Chemistry Letters*, *Journal of Solid State Chemistry*, *Lab on A Chip*, *Luminescence*, *Nanomedicine*, *Nano Energy*, *Nano Letters*, *Nanoscale*, *Nanotechnology*, *Nature Communications*, *Nature Nanotechnology*, *Optics Communications*, *Optical Express*, *Small* etc.

Member, Materials Research Society (2001-) Member, American Chemical Society (1998-) Member, Singapore National Institute of Chemistry (2008-)

PUBLICATIONS (PEER-REVIEWED)

[55] C. Shen, F. Shen, G. Zhou, H. Xia, X. Chen, X. Liu, P. Zhang, "Novel Carbohydrate-derived Prolinamide as a Highly Efficient, Recoverable Catalyst for Direct Aldol Reactions in Water," ***Catalysis Communications*** 2012, in press.

[54] C. Shen, H. Xia, H. Yan, X. Chen, S. Ranjit, X. Xie, D. Tan, R. Lee, Y. Yang, B. Xing, K.-W. Huang, P. Zhang*, X. Liu*, "A concise, Efficient Synthesis of Sugar-based Benzothiazoles through Chemoselective Intramolecular C-S Coupling," ***Chemical Science*** 2012, in press.

[53] X. Xie, W. Xu, X. Liu*, "Improving Colorimetric Assays through Enzyme-Assisted Gold Nanoparticle Amplification," ***Accounts of Chemical Research*** 2012, revised (Invited Review Article).

[52] W. Xu, X. Xie, D. Li, Z. Yang, T. Li, X. Liu*, "Ultrasensitive Colorimetric DNA Detection using a Combination of Rolling Circle Amplification and Nicking Endonuclease-Assisted Nanoparticle Amplification (NEANA)," ***Small*** 2012, in press.

[51] X. Liu, X. Liu*, "Bimetallic Nanoparticles: Kinetic Control Matters," ***Angewandte Chemie*** 2012, 124, 3367-3369; ***Angewandte Chemie International Edition*** 2012, 51, 3311-3313 (Invited Research highlight).

[50] G. Lu, S. Li, B. G. Hauser, X. Qi, Y. Wang, X. Wang, S. Han, X. Liu, J. S. Duchene, H. Zhang, Q. Zhang, X. Chen, J. Ma, S. C. J. Loo, W. Wei, Y. Yang, O. K. Farha, J. T. Hupp, F. Huo, "Imparting Functionality to a Metal-Organic Framework Material by Controlled Nanoparticle Encapsulation," ***Nature Chemistry*** 2012, 4, 310-316.

[49] Y. Yang, Q. Shao, R. Deng, X. Teng, C. Wang, K. Cheng, Z. Cheng, L. Huang, Z. Liu, X. Liu*, B. Xing*, "In Vitro and In Vivo Uncaging and Bioluminescence Imaging through Photocaged Upconversion Nanoparticles," ***Angewandte Chemie*** 2012, 124, 3179-3183; ***Angewandte Chemie International Edition*** 2012, 15, 3125.

- [48] R. Deng, X. Xie, M. Vendrell, Y.-T. Chang, X. Liu*, "Intracellular Glutathione Detection using MnO₂-Nanosheet-Modified Upconversion Nanoparticles," **Journal of the American Chemical Society** 2011, 133, 20168-20171.
- [47] S. Ranjit, R. Lee, D. Heryadi, C. Shen, J. Wu, P. Zhang, K. Huang, X. Liu*, "Copper-Mediated C-H Activation/C-S Cross-Coupling of Heterocycles with Thiols," **Journal of Organic Chemistry** 2011, 76, 8999-9007.
- [46] F. Wang, R. Deng, J. Wang, Q. Wang, Y. Han, H. Zhu, X. Chen, X. Liu*, "Energy Migration Upconversion in Lanthanide-Doped Core-Shell Nanocrystals," **Nature Materials** 2011, 10, 968-973 (Highlighted in News and Views in Nature Materials, MRS Bulletin, Nature Middle East, and Nanomedicine).
- [45] X. Su, X. Liu, "The Plasmonic Ruler Goes 3D!," **ChemPhyChem: A European Journal of Chemical Physics and Physical Chemistry** 2011, 12, 2707-2708 (Invited research highlight).
- [44] J. Wang, F. Wang, C. Wang, Z. Liu, X. Liu*, "Single-Band Upconversion Emission in Lanthanide-Doped KMnF₃ Nanocrystals," **Angewandte Chemie** 2011, 123, 10553; **Angewandte Chemie International Edition** 2011, 50, 10369-10372.
- [43] H. Wang, W. Xu, H. Zhang, D. Li, Z. Yang, X. Xie, T. Li, X. Liu*, "EcorRI-Modified Gold Nanoparticles for Dual-Mode Colorimetric Detection of Magnesium and Pyrophosphate Ions," **Small** 2011, 7, 1987-1992.
- [42] X. Xue, F. Wang, X. Liu*, "Emerging Functional Nanomaterials for Therapeutics," **Journal of Materials Chemistry** 2011, 21, 13107-13127 (Invited Review Article).
- [41] L. K. Tan, X. Liu, H. Gao, "Vertically Standing, Highly Ordered, and Dimension and Morphology Controllable TiO₂ Nanotube Arrays via Template-Assisted Atomic Layer Deposition," **Journal of Materials Chemistry** 2011, 21, 11084-11087.
- [40] Y. Liu, F. Boey, L. L. Lao, H. Zhang, X. Liu, Q. Zhang, "Postchemistry of Inorganic-Organic Hybrid Particles in Aqueous Solution: Metal-Cation Exchange," **Chemistry: An Asian Journal** 2011, 6, 1004-1006.
- [39] X. Xie, W. Xu, T. Li, X. Liu*, "Colorimetric Detection of HIV-1 Ribonuclease H Activity by Gold Nanoparticles," **Small** 2011, 7, 1393-1396.
- [38] S. Ranjit, X. Liu*, "Direct Arylation of Benzothiazoles and Benzoxazoles with Arylboronic Acids," **Chemistry: A European Journal** 2011, 17, 1105-1108.
- [37] H. Zhang, W. Xu, X. Liu, F. Stellacci, J. T. L. Thong, "Capturing a Single DNA Duplex under Near-Physiological Conditions," **Applied Physics Letters** 2010, 97, 163702.
- [36] H. Zhang, C.-L. Wong, Y. Hao, R. Wang, X. Liu, F. Stellacci, J. T. L. Thong, "Self-aligned Nanolithography by Selective Polymer Dissolution," **Nanoscale** 2010, 2, 2302-2306.
- [35] Y. Wang, G. Chen, M. Yang, G. Silber, S. Xing, L. H. Tan, F. Wang, Y. Feng, X. Liu, S. Li, H. Chen, "Stoichiometry-Controlled Cross-coupling of Nanoparticles," **Nature Communications** 2010, doi: 10.1038/NComms1089.
- [34] X. Liu*, "Aligned Conjugated Polymers Standing Upright," **Small** 2010, 6, 2333-2335 (Research highlight).
- [33] S. Ranjit, Z. Duan, P. Zhang, X. Liu*, "Synthesis of Vinyl Sulfides by Copper-Catalyzed Decarboxylative C-S Cross-Coupling," **Organic Letters** 2010, 12, 4134-4136.
- [32] J. Xu, H. Wang, C. Liu, Y. Yang, T. Chen, Y. Wang, F. Wang, X. Liu, B. Xing, H. Chen, "Mechanical Nano-Springs: Induced Coiling and Uncoiling of Ultrathin Au Nanowires," **Journal of the American Chemical Society** 2010, 132, 11920-11922.
- [31] F. Wang, J. Wang, X. Liu*, "Direct Evidence of Surface Quenching Effect on Size-Dependent Luminescence of

Upconversion Nanoparticles,” **Angewandte Chemie** 2010, 122, 7618-7622; **Angewandte Chemie International Edition** 2010, 49, 7456-7460 (Selected as a Very Important Paper).

[30] N. Wu, J. Wang, D. N. Tafen, H. Wang, J.-G. Zheng, J. P. Lewis, X. Liu, S. S. Leonard, A. Manivannan, “Shape-Enhanced Photocatalytic Activity of Single-Crystalline Anatase TiO₂ (101) Nanobelts,” **Journal of the American Chemical Society** 2010, 132, 6679-6685.

[29] Z. Duan, S. Ranjit, X. Liu*, “One-Pot Synthesis of Amine-Substituted Aryl Sulfides and Benzo[b]thiophene Derivatives,” **Organic Letters** 2010, 12, 2430-2433.

[28] F. Wang, D. Banerjee, Y. Liu, X. Chen, X. Liu*, “Upconversion Nanoparticles in Biological Labeling, Imaging and Therapy,” **Analyst** 2010, 135, 1839-1854 (Top cited article for 2010 and 2011).

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[24] F. Wang, Y. Han, C. S. Lim, Y. Lu, J. Wang, J. Xu, H. Chen, C. Zhang, M. Hong and X. Liu*, “Simultaneous Phase and Size Control of Upconversion Nanocrystals through Lanthanide Doping,” **Nature** 2010, 463, 1061-1065 (Highlighted in Physics World magazine, Analyst with Insight Media, Lianhe Zhaobao, Materials Today, and Xinhua News).

[23] C. Jiang, S. Ranjit, Z. Duan, Y. L. Zhong, K. P. Loh, C. Zhang and X. Liu*, “Nanocontact-induced Catalytic Activation in Palladium Nanoparticles,” **Nanoscale** 2009, 1, 391-394.

[22] H. Zhang, R. J. Barsotti, C.-L. Wong, X. Xue, X. Liu, F. Stellacci and J. T. L. Thong, “Polymer-Protected Sub-2-nm-Nanogap Fabrication for Biological Sensing in Near-Physiological Conditions,” **Small** 2009, 5, 2797-2801.

[21] X. Xue, W. Xu, F. Wang and X. Liu*, “Multiplex Single-Nucleotide Polymorphism Typing by Nanoparticle-Coupled DNA-Templated Reactions,” **Journal of the American Chemical Society** 2009, 131, 11668-11669.

[20] X. Liu, “Zinc Oxide Nano- and Microfabrication from Coordination-Polymer Templates,” **Angewandte Chemie International Edition** 2009, 48, 3018-3021 (Invited research highlight).

[19] Z. Duan, S. Ranjit, P. Zhang, X. Liu*, “Synthesis of Aryl Sulfides via Decarboxylative C-S Cross-Couplings,” **Chemistry: A European Journal** 2009, 15, 3666-3669.

[18] W. Xu, X. Xue, T. Li, H. Zeng and X. Liu*, “Ultrasensitive and Selective Colorimetric DNA Detection by Nicking Endonuclease-Assisted Nanoparticle Amplification,” **Angewandte Chemie International Edition** 2009, 48, 6849-6852 (Selected as a Very Important Paper and featured as a journal inside-cover article).

[17] F. Wang and X. Liu*, “Recent Advances in the Chemistry of Lanthanide-Doped Upconversion Nanocrystals,” **Chemical Society Reviews** 2009, 38, 976-989 (Invited Review Article).

[16] C. Jiang, F. Wang, N. Wu, X. Liu*, “Up- and Down-Conversion Cubic Zirconia and Hafnia Nanobelts,” **Advanced Materials** 2008, 20, 4826-4829 (Selected as a Very Important Paper contribution)

[15] F. Wang and X. Liu*, “Upconversion Multicolor Fine-Tuning: Visible to Near-Infrared Emission from Lanthanide-Doped NaYF₄ Nanoparticles,” **Journal of the American Chemical Society** 2008, 130, 5642-5643.

[14] X. Xue, F. Wang and X. Liu*, "One-Step, Room Temperature, Colorimetric Detection of Mercury (Hg^{2+}) Using DNA/Nanoparticle Conjugates," **Journal of the American Chemical Society** 2008, 130 3244-3245 (Selected by the editor and highlighted in JACS Select #5 issue: Chemistry at the Nano-Bio Interface).

[13] F. Wang, X. Xue and X. Liu*, "Multicolor Tuning of (Ln, P)-Doped YVO_4 Nanoparticles by Single Wavelength Excitation," **Angewandte Chemie International Edition** 2008, 47, 906-909 (Featured as a journal inside-cover article).

[12] J. Yuan, X. Liu, O. Akbulut, J. Hu, S. Suib, J. Kong, F. Stellacci, "Recyclable, Thermal-Stable, Selective, Superwetting Nanowire Membranes," **Nature Nanotechnology** 2008, 3, 332-336 (Highlighted in The Straits Times, The Sunday Times (UK), Yahoo News, MIT Technology Reviews, Nature News, Discovery Channel, and NewScientist).

Before Joining NUS

[11] X. Liu, N. Wu, B. H. Wunsch, R. J. Barsotti, F. Stellacci, "Shape-controlled Growth of Micrometer-sized Gold Crystals by a Slow Reduction Method," **Small** 2006, 2, 1046-1050.

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[9] M. V. Ovchinnikov, A. M. Brown, X. Liu, C. A. Mirkin, L. N. Zakharov, A. L. Rheingold, "Ligand Dissymmetric Metallomacrocycles Generated via the Weak-Link Approach," **Inorganic Chemistry** 2004, 43, 8233-8235.

[8] J.-M. Nam, S. Han, K. Lee, X. Liu, M. Ratner, C. A. Mirkin, "Bioactive Protein Nanoarrays on Nickel Oxide Surfaces Formed by Dip-Pen Nanolithography," **Angewandte Chemie International Edition** 2004, 43, 1246-1249.

[7] X. Liu, S. Guo, C. A. Mirkin, "Surface and Site-Specific Ring-Opening Metathesis Polymerization Initiated by Dip-Pen Nanolithography," **Angewandte Chemie International Edition** 2003, 42, 4785-4788.

[6] J.-M. Nam, M. A. Ratner, X. Liu, C. A. Mirkin, "Single-Walled Carbon Nanotubes and C_{60} Encapsulated by a Molecular Macrocycle," **Journal of Physical Chemistry B** 2003, 107, 4705-4710.

[5] L. Fu, X. Liu, Y. Zhang, V. P. Dravid, C. A. Mirkin, "Nanopatterning of Hard Magnetic Nanostructures via Dip-Pen Nanolithography and a Sol-Based Ink," **Nano Letters** 2003, 3, 757-760.

[4] X. Liu, C. L. Stern, C. A. Mirkin, "Chemical Origami: Formation of Flexible 52-Membered Tetranuclear Metallacycles via a Molecular Square Formed from a Hemilabile Ligand," **Organometallics** 2002, 21, 1017-1019.

[3] M. Su, X. Liu, S.-Y. Li, V. P. Dravid, C. A. Mirkin, C. A., "Moving Beyond Molecules: Patterning Solid-State Features via Dip-Pen Nanolithography with Sol-Based Inks," **Journal of the American Chemical Society** 2002, 124, 1560-1561.

[2] X. Liu, L. Fu, S. Hong, V. P. Dravid, C. A. Mirkin, "Arrays of Magnetic Nanoparticles via Dip-Pen Nanolithography," **Advanced Materials** 2002, 14, 231-234.

[1] X. Liu, A. H. Eisenberg, C. L. Stern, C. A. Mirkin, "Flexible Redox-Active Binuclear Macrocycles Formed via the Weak-Link Approach and Novel Hemilabile Ligands with N,N,N',N'-Tetramethyl-1,4-phenylenediamine Units," **Inorganic Chemistry** 2001, 40, 2940-2941.

BOOK CHAPTERS

[1] Liu, X.; Zhang, H., "Scanning Probe Microscopy-Based Nanofabrication for Emerging Applications In Modern Research and Educational Topics in Microscopy," Mendez Vilas, A and Diaz, J. Eds, Formatex (2007).

[2] Zhou, X.; Liu, X.; Boey, F. Y. C.; Zhang, H., “*Integrated Nanostructures and Nanodevices Fabricated by Dip-Pen Nanolithography* In Topics in Multifunctional Biomaterials & Devices, ”Ashammakhi, N. Ed, http://www.oulu.fi/spareparts/ebook_topics_multifunctional/index.html, Chapter 13, Pages 1-18 (2008)

[3] Wang, F.; Liu, X., “*Rare-Earth Doped Upconversion Nanophosphors* In Comprehensive Nanoscience and Technology,” Nann, T. Ed, Elsevier (2010)

PATENTS

[1] Yuan, J.; Liu, X.; Kong, J.; Stellacci, F. “*Recyclable, Thermal-Stable, Selective, Superwetting Nanowire Membranes*,” US Provisional Application filed, 2007.

[2] Mirkin, C. A.; Liu, X.; Guo, S. “*Surface and Site-specific Polymerization by Direct-write Lithography*,” United States Patent 7326380.

[3] Mirkin, C. A.; Dravid, V. P.; Su, M.; Liu, X. “*Patterning of Solid State Features by Direct Write Nanolithographic printing*,” United States Patent 7,811,635 B2.

[4] Mirkin, C. A.; Dravid, V. P.; Liu, X.; Fu, L. “*Patterning magnetic nanostructures*,” United States Patent 7223438.