

Niti Garg

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Objective: Obtain a challenging position of a chemist in a prestigious lab, utilizing research, communication and leadership skills.

Education

Ph.D. (Chemistry), **Carnegie Mellon University, Pittsburgh** 2005 – 2010
Dissertation Title: ‘*Synthesis and study of metal nanoparticles: application to chemical sensing and catalysis*’ Advisor: *Rongchao Jin* Defense December 2010
M.S. (Chemistry), **Carnegie Mellon University, Pittsburgh** 2005 - 2007
M.Sc. (Chemistry), **Indian Institute of Technology, Delhi** 2003 – 2005
B.Sc. (Chemistry), **St. Stephens College, Delhi University, Delhi** 2000 - 2003

Skills

- **Synthesis :** Organic synthesis, nanoparticles wet synthesis (one phase and two phase)
- **Characterization :** Ultraviolet-Visible spectroscopy (UV-Vis), Nuclear magnetic resonance (NMR), Fourier transformed-Infrared (FTIR) spectroscopy, Mass spectrometry : matrix assisted laser desorption Ionization (MALDI), Electrospray ionization (ESI), Circular Dichorism (CD), Raman Spectroscopy, Mossbauer Spectroscopy, Dynamic light scattering (DLS), Isothermal titration calorimetry, X-ray Diffraction (XRD), Thermal gravimetric analysis(TGA), Four probe resistance measurements, Fluorescence spectroscopy, Transmission electron microscopy (TEM), Selected area electron diffraction (SEAD) and SEM (Scanning electron microscopy)
- **Purification :** Ion exchange chromatography, Thin Layer Chromatography (TLC), High Pressure Liquid Chromatography (HPLC), Fast Protein Liquid Chromatography (FPLC)
- **Software Expertise :** Mathematica, Chemdraw, Gaussian view, Igor, Origin, MS office
- **Biological work :** Cell culture and enzyme extraction

Research Experience

Position title : Graduate Researcher, 2005-2010

- Study 1: Understanding the mechanistic details for the anisotropic shape development in gold nanoparticles. Study the influence of additives like surfactants, salt and seeds on the final shape and surface of nanoparticles. **Techniques used in this study are TEM, UV-Vis spectroscopy, DLS, HRTEM and mass spectrometry.**
- Study 2: Synthesis of novel Ag₁₀ clusters using amino-acid based surfactant, determined the chemical composition based on mass spectrometry. **The clusters show an interesting UV-Vis spectrum consisting of five absorption bands, and emit red fluorescence.** An observed strong CD signal for the Ag clusters different from the pure ligand confirms that nanoclusters have well-defined stereostructures.
- Study 3: Synthesis of noble metal nanodendrites /nanorods using wet-synthesis approach and study of their catalytic activities towards organic coupling reactions based on NMR analysis. **High resolution-TEM, SEAD and XRD analysis reveals that particles are crystalline with ample high-index facets.** The important role of halide ions in growth of anisotropy in nanoparticles growth has also been discovered and explored new insights into the crystal structure of nanorods.
- Study 4: Use of thiol coated gold nanoparticles for chemical sensing. Nanoparticles coated with new thiol ligand were used as receptors for **chemiresistive based chemical sensing**. Detected VOCs to sub-ppm levels. High stability for time, temperature and humidity is achieved. **TGA analysis and TEM were used to differentiate between the nature of trithiol and monothiol coated nanoparticles.**
- Study 5: Kinetic Controlled Synthesis of Au₂₅ nanoclusters. High yield and pure crystals were obtained. **Mass spectrometry, Dynamic light scattering and X-ray crystallography techniques** were used for structure elucidation and understanding of cluster growth.

Position title: M.Sc. Project researcher, 2003-2005

- Study 6 : Production of alkaline protease from *Pseudomonas Aeruginosa* cells immobilized in calcium alginate

Position title: Visiting Student Research Fellow, Summer 2004

- Study 7 : Microcalorimetric studies on the substrate binding of enzyme 'cytochrome P450cam'

Publications

- Zhu, Manzhou; Lanni, Eric; **Garg, Niti**; Bier, Mark E.; Jin, Rongchao, "Kinetic controlled high-yield synthesis of Au₂₅ cluster" *Journal of American Chemical Society*, 2008, 130 (4), 1138-1139
- **Garg, Niti**; Scholl, Clark; Mohanty, Ashok; Jin, Rongchao, "The role of bromide ions in seeding growth of Au nanorods." *Langmuir*, 2010, 26 (12), 10271-10276
- Mohanty Ashok; **Garg, Niti**; Jin Rongchao, "A universal approach for the synthesis of noble metal nanodendrites and their catalytic properties" *Angewandte Chemie* (International ed. in English) (2010), 49(29), 4962-6
- **Garg, Niti**; Mohanty, Ashok; Lazarus, Nathan; Santhanam, Suresh; Schultz, Lawrence; Snyder, Jay L.; Weiss, Lee E.; Fedder, Gary K.; Jin, Rongchao, "Robust gold nanoparticles stabilized by trithiols for application in chemiresistive sensors (*Journal of nanotechnology*, in press)
- Mohanty, Ashok; **Garg, Niti**; Jin, Rongchao, "****" (submitted to *JACS*)
- Zhu, Yan; Qian, Huifeng; **Garg, Niti**; Jin, Rongchao, "****" (manuscript submitted to *Journal of Catalysis*)
- Jin, Rongchao; Wu, Zhikun; Qian, Huifeng; Zhu, Yan; Zhu, Man-Zhou; Mohanty, Ashok; **Garg, Niti**, "****" (submitted to *The Journal of Physical Chemistry Letters*)
- Lazarus, Nathan; **Garg, Niti**; Jin, Rongchao ; Santhanam, Suresh ; Schultz, Lawrence; Snyder, Jay L.; Weiss, Lee E.; Fedder, Gary K., "Gold nanoparticle chemiresistive vapor sensors for respirator cartridge end-of-service-life indication" (under submission for *IEEE Sensors*)
- **Garg, Niti**; Yoon, Katherine; Jin, Rongchao, "Investigation on the role of seeding in the development of Gold nanorods" (under submission)

Posters & Presentations

- "Noble metal nanoflowers synthesized by novel approach based on pH dependent self assembly of surfactant and their extraordinary catalytic properties" paper at American Chemical Society Conference, Boston, MA., August 2010
- "A universal approach for the synthesis of noble metal nanoflowers and their excellent catalytic properties" paper at 5th Annual Cancer Nanobiology Think Tank, Frederick, MD, June 2010
- "Super robust gold nanoparticles stabilized by trithiols for sensing of volatile organic compounds" paper at 42nd Central Regional Meeting of the American Chemical Society, Dayton, OH, June 2010
- "Halide ions as shape directing agent for anisotropic gold nanoparticles" poster at American Chemical Society Conference, Washington, D.C. August 2009
- "Correlating Maldi-TOF mass spectrometry data of Au₂₅ nanoparticles with single crystal X-ray crystallography" poster at American Chemical Society Conference, Philadelphia, PA, August 2008
- "Charging a 25-gold atom nanoparticles with molecular electric field" paper at American Chemical Society Conference, Philadelphia, PA, August 2008
- "Jetted nano-particles chemical sensor circuit for respirator end-of-service life detection" paper at International Meeting on Chemical Sensors, Columbus, Ohio, July 2008
- "Single chip CMOS/MEMS compatible physical and chemical sensors for volatile organic compound detection" paper at US/Israel Nanoscience Workshop, Jerusalem, Israel, April 2008
- "Reduction of Au₂₅⁺ by micellar electric field induction" poster at SURF final presentation, Carnegie Mellon University, Pittsburgh, PA, March 2008

Teaching and Mentoring Experience

- Teaching Assistant (lab assistant) Introduction to Experimental Chemistry (Fall 2005)
- Teaching Assistant (recitation) Modern Chem I (Fall 2007, Fall 2008)
- Teaching Assistant (recitation) Modern Chem II (Spring 2006, Spring 2008, Fall 2009, Spring 2010)
- Teaching Assistant, Lab IV – Molecular Spectroscopy and Dynamic (spring 2007, Spring 2009)
- Mentor three undergrad student of CMU for laboratory research (since 2007- 2010)

**Affiliations
&
Honors**

- Member of GSAC (graduate student advisory council) Since Jan 2010
- Member of SEA (Scientist and Engineers of America) March, 2010
- Member of American Chemical Society Since Aug 2008
- Member of ISU (International Student Union) Since Aug 2008
- Graduate Student Conference Funding award July 2008
- Visiting Student Research Fellowship (Tata Institute of Fundamental Research) Summers 2004
- Department rank # 1 during M.Sc. at Indian Institute of Technology, Delhi 2003-2004
- Science Meritorious Award, Delhi University 2001
- Graduate student recognition award, Delhi University 2001-2003