

# KARTHIK S COLINJIVADI

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Availability: August 14, 2007

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## OBJECTIVE

To obtain a Development Engineer position related to design, modeling, fabrication and characterization of MEMS devices.

## SUMMARY OF QUALIFICATIONS

- 5+ years **cleanroom (class 1-100) experience** in MEMS development.
- **Multiple internships** as process development engineer in Etch (RIE), Thin Film Deposition (PVD) and Lithography (MEMS Fabrication).
- Demonstrated success in **developing MEMS devices and in their integration** to real world systems to achieve complete functionality.
- Strongly skilled in semiconductor processing technology with in-depth understanding and experience in **Lithography, Etching, Electroplating, Thin film deposition, Plasma processing** and a wide range of **Characterization** techniques.
- Extensive experience in **Finite Element Modeling** and **Labview Programming**.
- Working experience in **Design of Experiments (DOE)** to develop processes.
- Excellent written and verbal communication skills; strong problem solving and quick learning abilities; good team work spirit.
- Demonstrated **ability to teach and motivate** fellow workers.

## RESEARCH EXPERIENCE

**University of Texas at Dallas**, Richardson, TX.

*Aug 2003-Present*

**PhD RESEARCH ASSISTANT**, Micro/Nano Systems and Devices (MiNDS) Lab

Dissertation titled *“Polymer and Metal Alloy Microgrippers for Micromanipulation”*

- In-vitro cell-manipulation using polymer microgrippers
  - Designed, developed and characterized SU-8 based polymer microgrippers integrated with electrothermal actuator.
  - Developed Focused Ion Beam (FIB) assisted method for de-tethering high aspect ratio metal/polymer bi-layer devices.
  - Developed an optimized process for viable manipulation of biological cells using assembled polymer grippers.
  - Performed finite-element modeling using Ansys to model the static and transient response of microgrippers in various media. Currently developing analytical model to understand the thermodynamics and mechanics of the microgrippers.
- Metal and metal alloy microgrippers
  - Compared the electrothermal performance of electroplated nickel and nickel-manganese microgrippers.
  - Used wide range of characterization techniques including Energy Dispersive Spectrometry (EDS) and X-Ray Diffraction (XRD) to analyze the composition of the electroplated films.
- Other Tasks
  - Resourcefully guided projects for undergraduate students by training them on device and design fundamentals and processing techniques; projects include Fabrication of nickel-based electrothermal actuators and Characterization of ultra-high quality copper electroplating solution.

**University of Texas at Dallas**, Richardson, TX

*Dec 2001-Aug 2003*

**GRADUATE RESEARCH ASSISTANT**, Micro/Nano Systems and Devices (MiNDS) Lab  
Masters thesis titled “*Micromachined on-chip arch-shaped 3D toroidal inductor for high frequency RF applications*”.

- Performed simulation, design, fabrication and characterization of on-chip 3D toroidal inductors.
  - Utilized specialized fabrication techniques like conformal photoresist electrodeposition and photoresist deformation.
- Design optimization of on-chip 3D inductors
  - Performed simulations using Ansoft HFSS to compare performance of various geometries of solenoid and toroidal inductors.

## PROFESSIONAL EXPERIENCE

**Novellus Systems Inc.**, San Jose, CA

*Jun 2006-Aug 2006*

**PROCESS ENGINEER – INTERN**, Integrated Metals Business Unit

- Developed thin film TaN/Ta barrier/seed deposition (PVD) process for 65nm/45nm node devices.
  - Designed DOEs to improve deposited film quality by optimizing plasma ionization density using electromagnets, wafer RF bias, dep-etch cycling and pulsed deposition techniques.
  - Gained excellent knowledge in plasma physics and working knowledge of hollow cathode magnetron system.
  - Independently performed troubleshooting and partitioning of process abnormalities in the PVD tool.
  - Executed customer demos of barrier/seed deposition process on 300 mm electrical wafers with 45nm/65nm devices.

**Dallas Semiconductor-Maxim**, Dallas, TX

*Jun 2004-Aug 2004*

**PACKAGING ENGINEER- INTERN**, Wafer Level Packaging (WLP) division

- Developed an etch process for de-scum of Benzocyclobutene (BCB) using Lam 4420 Reactive Ion Etching (RIE) tool.
  - Designed and performed DOEs, followed by extensive data analysis, to arrive at the optimum etch-conditions for BCB removal.
  - Performed etch rate and etch uniformity analysis using thickness measurements made on Metricon thin film measurement system.
  - Investigated BCB oxidation and stability in the RIE system.
  - Assisted in converting the RIE system from 150mm to 200mm wafer handling capability.
- Repeatability and Reproducibility (R&R) Study of Tencor 4500 and 5500 Particle Counters.
  - Performed R&R study of the Particle Counters which were used to monitor particle contamination in the WLP area.
  - Performed updates to the working document for the operation of the tool based on my study.
- Characterization of Nanospec metrology tool to measure wide range of film thicknesses.
  - Optimized parameters like wavelength range, scan speed and Cauchy coefficients in the reference files for measuring different thicknesses of photoresists.

**Zyvex Corporation**, Richardson, TX.

*Feb 2003-May 2003*

**MEMS PROCESS INTERN**

- Developed UV lithography processes for fabricating metallic MEMS devices using multiple layers of positive and negative photoresists

## TEACHING EXPERIENCE

University of Texas at Dallas, Richardson, TX.

Aug 2004-May 2007

TEACHING ASSISTANT, Department of Electrical Engineering

- Guided graduate students in performing Ansys simulation of MEMS structures.
- Supervised Electronic Devices lab for undergraduate students.

## TECHNICAL SKILLS

- **UV lithography:** Photoresist process including both positive photoresist (Shipley series) and negative photoresist (SU-8); process optimization for stress free films.
- **E-beam lithography:** Photomask design and fabrication (both clear field and dark field).
- **Physical Vapor Deposition (PVD):** RF/DC – magnetron sputtering of Au, Cu, Cr, Ti, Ta, TaN; E-beam evaporation of metal thin films including Cu, Ni, Cr, and Au.
- **Chemical Vapor Deposition (CVD):** Low pressure (LPCVD) deposition of low temperature SiO<sub>2</sub> (LTO).
- **Electroplating:** Electroplating of wide thickness range of metal films including Cu, Ni, Ni-Mn, and Au. Ultra-high quality copper electroplating using suppressing, leveling and brightening agents.
- **Plasma Dry Etching:** Reactive Ion Etching of Si, SiO<sub>2</sub>, BCB, SU-8, metal films; Microwave plasma based isotropic etching.
- **Wet Etching:** Chemical etching of SiO<sub>2</sub>, Si, Cu, Ni, Au thin films.
- **Other Techniques:** Focused Ion Beam milling, Silicon bulk micromachining using dry and wet etching techniques.
- **Characterization:** Scanning Electron Microscope/ Energy Dispersive Spectrometry (EDS), X-Ray Diffraction (XRD), Zyvex L200 nanomanipulator, Umech MEMS Motion Analyzer (MMA), Tencor RS-100, Profilometer, Vector Network Analyzer, Nanospec and Metricon Thin Film Measurement Systems, Tencor Surfscan Particle Counter, Four-point probe measurements.
- **Design and Modeling Techniques:** ANSYS, Ansoft High Frequency Structure Simulator (HFSS), LASI, Magic, AutoCAD.
- **Software:** Microsoft Office tools, Labview, C/C++.

## EDUCATION

Aug 2003 – Aug 2007 (expected)	<b>Ph. D. EE</b>	Solid State Devices & Microsystems Fabrication, University of Texas at Dallas, USA. <b>GPA:</b> 3.62/4
Aug 2001– Aug 2003	<b>MS EE</b>	Solid State Devices & Microsystems Fabrication, University of Texas at Dallas, USA. <b>GPA:</b> 3.65/4
Jun 1997– May 2001	<b>BE</b>	Electronics & Communication Engineering, University of Madras, India. <b>GPA:</b> 3.8/4

## RELEVANT COURSES

- **Fabrication Courses:** Semiconductor Processing Technology, Introduction to MEMS.
- **Device Courses:** Fundamentals of Semiconductor Devices, Electron Devices, Active Semiconductor Devices, Quantum Physical Electronics, Fields and Waves.
- **Characterization courses:** Advanced Electron Microscopy.
- **Design Courses:** Analog Integrated Circuit Design, VLSI Design.

## PUBLICATIONS AND PRESENTATIONS

### *Journals*

- **Karthik Colinjivadi**, J-B. Lee, R.Draper, M.Ellis, “Viable cell handling with **high aspect ratio polymer chopstick gripper** mounted on a nano precision manipulator”, Journal of Microsystem Technologies, to be submitted in June 2007 for peer review.
- **Karthik Colinjivadi**, Yonghao Cui, Matthew Ellis, George Skidmore, and J-B. Lee, “**De-Tethering** of High Aspect Ratio Metallic and Polymeric MEMS/NEMS Parts for the Direct Pick-and-Place Assembly of 3D Microsystem”, Journal of Microsystem Technologies, to be submitted in June 2007 for peer review.

### *Conference Proceedings & Others*

- **Karthik Colinjivadi**, J-B. Lee, R.Draper, M.Ellis, “Viable cell handling with **high aspect ratio polymer chopstick gripper** mounted on a nano precision manipulator”, accepted for Oral presentation in HARMST 2007, June 7-9, 2007, Besancon, France.
- **Karthik Colinjivadi**, Yonghao Cui, Matthew Ellis, George Skidmore, and J-B. Lee, “**De-Tethering** of High Aspect Ratio Metallic and Polymeric MEMS/NEMS Parts for the Direct Pick-and-Place Assembly of 3D Microsystem”, accepted for Poster presentation in HARMST 2007, June 7-9, 2007, Besancon, France.
- **Karthik Colinjivadi**, J-B. Lee, Rockford Draper, Matthew Ellis, George Skidmore, and Gareth Hughes, “Polymer Microgrippers as End-Effectors for **Biological Sample Manipulation**”, ASME IMECE 2006, November 5-10 2006, Chicago, USA.
- **Karthik Colinjivadi**, Yonghao Cui, Matthew Ellis, George Skidmore, and J-B. Lee, “De-Tethering of Metallic and Polymeric MEMS/NEMS Parts for the Direct Pick-and-Place **Assembly** of 3D Microsystem”, ASME IMECE 2006, November 5-10, 2006, Chicago, USA.
- Meghana Honnatti, Gareth Hughes, **Karthik Colinjivadi**, J-B.Lee, “Directed Cellular Manipulation using Polymer Microgrippers”, April 2006, Application Note for Zyvex Corporation, Richardson, USA
- **Karthik Colinjivadi**, Matthew Ellis, George Skidmore, and J-B. Lee, “Development of Polymer Microgrippers”, TEXMEMS VII, September 20, 2005, El Paso, USA.
- Nimit Chomnawang, Hong Lu, **Karthik Colinjivadi** and J-B. Lee, “Design optimization of Micromachined High Aspect Ratio 3D **On-Chip Solenoid Inductor**”, Nanotech 2003, February 23-27, 2003, San Francisco, USA.
- Kabseog Kim, Trent Huang, Robert Folaron, Erik Nilsen, Hong Lu, **Karthik Colinjivadi**, Daniel Park, JB Lee, “**Poly/Metal Micromachining Methods** and their role in the Development of MEMS-Based Heterogeneous Microsystems”, Tex MEMS V , May 6, 2003, Fort Worth, USA.

## HONORS

- **Distinguished Teaching Assistant of the Year 2006**, Electrical Engineering, University of Texas at Dallas.