

ANUPAMA GOVINDARAJAN

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PERMANENT RESIDENT OF THE UNITED STATES

OBJECTIVE

Seeking a challenging position in the design and development of MEMS sensors and actuators.

EDUCATION

University Of Washington, Seattle, (WA).

Doctoral Candidate, Electrical Engineering (Expected Graduation Spring 09, GPA 3.86)

The Pennsylvania State University, University Park, (PA).

Master of Science, Electrical Engineering (01/01-06/02, GPA 3.75)

University of Mumbai (Bombay), India

Bachelor of Engineering, Electronics Engineering (06/95 – 06/99)

RESEARCH EXPERIENCE

- **Intracellular Neuronal Recording With Flexible Micro-Machined Probe Implants (Work towards PhD thesis)**

Current work includes the design, fabrication and testing of an implantable BioMEMS sensor capable of intracellular neuronal recording. This is the first evidence of intracellular interrogation by an integrated implantable MEMS sensor. The success of this prototype is a major step toward self contained implantable devices suited for intracellular neuronal recording from freely behaving animals.

Evaluation of candidate biomaterials as possible coatings for neural electrodes. Biomaterials supplied by the Ratner Lab, University of Washington Engineered Biomaterials (UWEB).

Low temperature selective vapor liquid solid (VLS) growth in the hot wire chemical vapor deposition (HWCVD) of a silicon needle array suitable for intracellular neuronal recording. This low temperature growth technique has the potential of integration of CMOS circuitry and materials like polyimide with neural electrodes. (In collaboration with the Retinal Implant Project at the Indian Institute of Technology, IIT Bombay)

Independently initiated and developed research collaborations between the IIT Bombay (India) and University of Washington (2007-present).

Currently training a team at IIT Bombay to continue with the development of a retinal implant based on my thesis work.

- **Vapor Phase Etching Of Sacrificial Oxide In Micro Electro Mechanical Systems (Master's thesis)**

Evaluated the feasibility of using a mixture of anhydrous hydrofluoric acid and methanol to etch sacrificial oxide at low substrate temperatures as opposed to wet etching processes. **Currently being implemented as a "stiction free MEMS etch release capability" by Primaxx Inc.**

- **Controls for Real Time Dosimetry**
Designed the position control system for a robot used for radiation therapy in cancer treatment. Undergrad project at **Bhabha Atomic Research Center Bombay, India** (1998-1999)
- Microfabricated Cell Interrogation Device To Study Cell Viability
Fabricated poly(ethylene)glycol hydrogel microstructures encapsulating living cells

MEMS SKILLS

- **7 years of clean room experience**
 - Formulated process sequencing for a 5 mask process to integrate stand alone silicon needles via flexible polyimide-aluminum-polyimide interconnects to aluminum base pads on a thick silicon base.
 - Design of device geometry and process modifications to produce high aspect ratio sub μm silicon needles, with positive profiles using a combination of **DRIE** to form the needle pillar and **RIE** to sharpen the needles.
 - Process design for oxide coatings on polyimide and high aspect ratio silicon structures using **PECVD** process.
 - Characterization of a **Hot-Wire-CVD (HWCVD)** process for low temperature, patterned silicon needle array growth using vapor-liquid-solid (VLS) mechanism.
 - SEM, EBL, AFM, Silanization and contact angle imaging.
 - Laser writing and cutting.
 - **Non silicon based MEMS – Polyimide, Poly(ethylene)glycol hydrogel microstructures.**
- L-Edit and Clewin software for mask design (5 mask lithography process)
- Cadence
- CoventorWare MEMS simulation software
- MUMPS Design
- Testing
 - Measurement of intracellular action potentials from a specific neuron (Pd5) in an isolated brain of a sea slug *Tritonia Diomedea* using implantable silicon probe devices.
 - Electrochemical characterization of biocompatible coatings (from Prof. Buddy Ratner's Lab at UW) for implantable electrodes.

TEACHING ASSISTANT AT THE UNIVERSITY OF WASHINGTON

- EE 502 "Introduction to MEMS" (Fall 03, 04, 05 and 08)
- EE 486 "Fundamentals of Integrated Circuit Technology" (Winter 06)
- EE 331 "Devices and Circuits – I" (Spring 05)
- EE 233 "Circuit Theory" (Winter 05)
- EE 271 "Digital Circuits and Systems" (Summer 04)

PUBLICATIONS

- A.V.Govindarajan, T.C.Chen, R.C.Wyeth, A.O.D.Willows and K.F.Böhringer, "Intracellular Neuronal Recording With Flexible Micro-Machined Probe Implants." *Solid State Sensor, Actuator, and Microsystems Workshop (Hilton Head'04)*, Hilton Head Island, SC, June 6-10, 2004. pp172-175.
- A.V.Govindarajan, M.Joshi, S.Mukherji, R.Rao and K.F.Böhringer, "Engineering the Hydrophobicity Oxide Surfaces by Controlling the Dehydration Temperature of Silanization", *European Materials Research Society Symposium on Protective Coatings and Thin Films (EMRS)*, Strasbourg, France, May 28 - June 1, 2007.

- A.V.Govindarajan, S.Paluri, A.Sharma, R.Rao and K.F. Bohringer, “Selective Vapor Liquid Solid Growth of Needle Arrays by Hot Wire Chemical Vapor Deposition with Low Substrate Temperature”, accepted at *The fifteenth International Conference on Solid State Sensors, Actuators and Microsystems (Transducers'09)*, Denver, Colorado, June 21-25 2009.

AWARDS

- Ph.D. thesis work won the first prize for the most innovative research at the Pacific Northwest Workshop on Neural Engineering – Oct 9-11, 2008, Redmond WA.
- National Institutes of Health - University of Washington Engineered Biomaterials Training Grant Fellowship 2006-2008.
- Spirit of the Community Award 2004 – Electrical Engineering, University of Washington.

REFERENCES

Available on request