



Centre of Excellence in MEMS and Micro-fluidics Rajalakshmi Engineering College



CEMM - REC

Rajalakshmi Engineering College

Rajalakshmi Nagar,

Thandalam, Chennai—602105

Phone: +91-44-37181044

Fax: +91-44-37181113

E-mail: cemm@rajalakshmi.edu.in

<http://www.rajalakshmi.org>

About Us

About Rajalakshmi Engineering College:

Rajalakshmi Engineering College (REC) is one of the leading ISO 9001-2000 certified and NAAC and NBA accredited engineering colleges established under self-financing scheme in 1997. The college has been growing from strength to strength in the last 12 years and moving ahead to become a Centre of Excellence in Engineering, Management Education, Research and Development. The college is located in a serene atmosphere amidst many multinational companies in Thandalam, about 25 km from Chennai on the Bangalore National Highway (NH4), providing the right industrial ambience for the budding engineers. The institution currently offers 10 UG programs, 8 PG programs and 3 Research programs. For more information, please visit www.rajalakshmi.org

Centre of Excellence for MEMS & Microfluidics (CEMM):

Centre of Excellence for MEMS & Microfluidics (CEMM) at REC motivates the research activity in the field of MEMS and Micro-fluidics from design to fabrication of prototypes. The main objective of the center is to design and fabricate successful devices using non-silicon substrates and low-cost process flow suitable for mass production. The Center has the laboratory facilities such as National MEMS Design Centre, Electronics Wet lab, UV Exposure room, Characterization lab and Thin Film Deposition Lab. Recently, this center is augmented with Clean Room facilities of type ISO 6 and ISO 7. We designed and fabricated several micro devices such as Micro Tweezers, MEMS Gyroscope, Micro Heater, Tri-axes Accelerometer, Digital Microfluidics etc. under NPMASS and INUP Programs. We fabricate polymer micro-fluidic devices using soft lithography technique. We are carrying out sponsored research projects under various funding agencies such as DST, DRDO, AICTE and UGC. We also collaborate with Industries and National Research Laboratories.

Patents, Funded Projects & Publications

Patents Applied:

1. Micro-fluidic Capacitive Sensors
2. Planar Micro Heater Design for Uniform Surface Temperature
3. MEMS Microphone using Polyimide Membrane

Funded Projects:

1. Fabrication Of Super Capacitors Using Conducting Polymers For Automobiles [Funded by AICTE] - 9.5 Lakhs—Two Years (2010—2012) - Completed
2. Fabrication of Polymser micro molds for MEMS Biosensor using soft lithography techniques. [Funded by DRDO] - 21.686 Lakhs—Two Years (2014—2016) - Completed
3. Fabrication of MEMS devices with Thin Film technology [under Internal Funding] - 11.3 Lakhs—One Year (2014—2015) - On going
4. Fabrication of low cost MEMS microfluidic devices using metal embossing technology on glass for lab on chip applications [Funded by DST] - 124 Lakhs—Three Years (2015-2018) - On going
5. Fabrication of MEMS Accelerometer for vibration sensing in gas turbines [Funded by GTRE] - 9.96 Lakhs—1 Year (2016-2017) - On going

Recent Journal Publications:

1. S.Suganthi, L.Sujatha and P. Rajasekar “Fabrication of Uric Acid Sensor using Covalently Immobilized Uricase Enzyme on Poly Dimethyl Siloxane (PDMS)” *J.Micro/Nanolith. MEMS MOEMS*. Under Revision
2. K.Karthikeyan, L.Sujatha , R. Sundar and S.K. Sharma“ Dimension Tolerances in Fabrication of Polymer Micri-Fluidic Devices “ *Microsystem Technologies* Manuscript submitted
3. L.Sujatha, S.Kalaiselvi, N. Vigneshwaran and R.Sundar “ Out plane Characterization of Silicon - On – Insulator multiuser MEMS process based Tri— axis Accelerometer” *J.Micro/Nanolith. MEMS MOEMS*. Under Review
4. L.Sujatha, M. Siddhartha Gautham, M. Saravanan and V.S.Selvakumar, “Performance of SOI MUMPS based Electro Thermally Actuated S ilicon Micro Grippers” *J.Micro/Nanolith. MEMS MOEMS*. Vol. 12, Issue 3, 033020 Sep 2013, DOI: 10.1117/1.JMM.12.3.033020.
5. L. Sujatha, N. Vigneswaran and Mohamed Yacin, “Design and Analysis of Electrostatic Micro Tweezers with Optimized hinges for biological applications using Coventorware”, *Procedia Engineering*, (2013) Vol No. 64, 283 – 291 DOI: 10.1016/j.proeng.2013.09.100. and more

Micro Fabrication Facilities

Clean Room Facilities

Clean Room ISO 6

Clean Room ISO 7



UV Exposure System (Flow & Force Engineers)



Dry Film Laminator System (Flow & Force Engineers)



Deionized Water Unit (Milli-Q)



DC & RF Sputtering (HHV)



Electroplating Work Station



Thermal Evaporation System (Hydro Pneo Vac Technologies)



Thermal Compression system (HHV)



Deep freezer (Elanpro)

Characterization Facilities



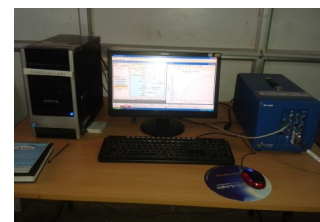
HD Optical Microscope (Leica DM2700M)



Fluorescence Spectrophotometer (Agilent FL1201M002)



Mask Aligner (Karl Suss)



Electro Chemical Workstation (Biologic SP 240)



Spin Coater (Apex Instruments NXG-P1)



LCR Meter (Agilent 4263B)



Precision Source/Measure Unit (Agilent B2902A)



Data Acquisition/Switch Unit (Agilent 34972A)



LCR Meter (Hioki IM3536)



Programmable Microfluidics Syringe Pump (TSE 540060 HP)

National MEMS Design Center

A National MEMS Design Centre (NMDC) at our institute has been established as a centralized facility, under National Program on Micro and Smart Systems (NPMASS), Govt. of India for the benefit of users from the region. REC motivates the research activity in the field of MEMS by proper utilization of the facilities provided by NPMASS from design to fabrication of prototype MEMS products and specific field applications. REC will also facilitate external researchers from other interested institutes (academic or National Labs subject to individual software licensing conditions) to use the design tools.

INVESTIGATORS:

Dr. L. Sujatha, Prof/ECE

Dr. R. Sundar, Prof/ECE

Dr. Natteri M. Sudarsanan, Prof/Mech

Mrs. Suganthi, Asso.Prof/ECE

Mr. V.S. Selvakumar, Asso.Prof/ECE

MEMS CAD TOOLS:

Coventorware —1 License

Intellisuite —2 Licenses

Tanner EDA Tool —1 License

MEMS +2.0 — 1 License

Comsol Multiphysics—30 Class kit

NISA—1 License

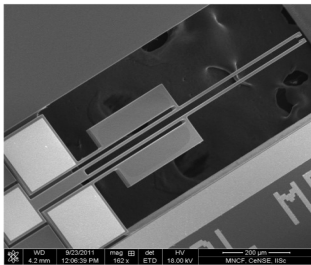
license & one research License

National MEMS Design Centre, REC



MEMS Devices fabricated under Community Chip Fabrication Program (NPMASS)

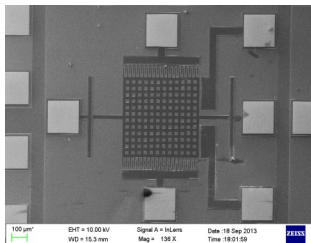
NMDC- REC is very active in submitting successful design files for fabrication to Community Chip Fabrication Program, sponsored by NPMASS Program. We have fabricated Silicon Micro Tweezers, Micro Heater, MEMS Gyroscope, Digital Microfluidic device and MEMS Tri-axes Accelerometer under this program.



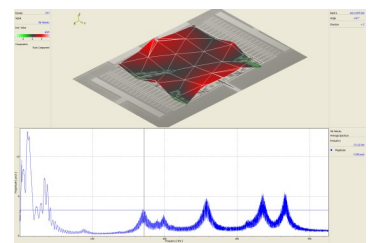
Electro Thermally actuated Silicon Micro Tweezers: The design and simulation of Electro-thermally actuated silicon microtweezers using SOI-MUMPS process flow was done at NMDC-REC. The devices were fabricated by SOI-MUMPS foundry at MEMSCAP Inc. through NPMASS. Characterization of the devices were carried out at CeNSE, IISc, Bangalore. The displacement of each arm is observed to be 24 μm for the applied voltage of 10 V. The response time of the device is less than 5 ms and the maximum power dissipation is 110 mW.



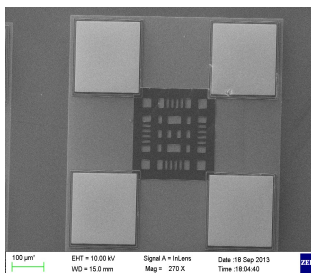
J.Micro/Nanolith. MEMS MOEMS. Vol. 12, Issue 3, 033020 Sep 2013



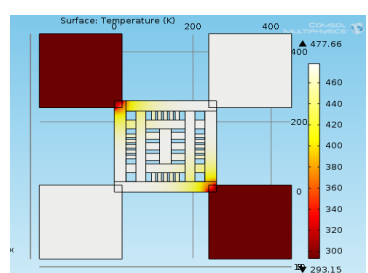
MEMS Gyroscope: The design and simulation of MEMS Gyroscope using POLY-MUMPS process flow was done at NMDC-REC. The devices were fabricated by POLY-MUMPS foundry at MEMSCAP Inc. through NPMASS. Characterization of the devices were carried out at CeNSE, IISc, Bangalore. Figures on left and right sides show the SEM picture and the modes of vibration on the fabricated device.



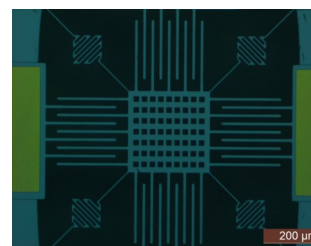
Journal paper submitted to *J.Micro/Nanolith. MEMS MOEMS*



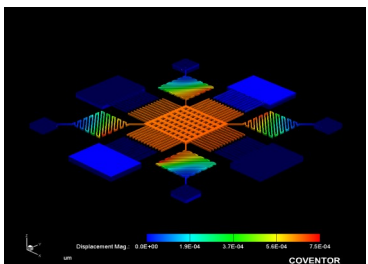
Microheater: The design and simulation of Microheater using POLY-MUMPS process flow was done at NMDC-REC. The devices were fabricated by POLY-MUMPS foundry at MEMSCAP Inc. through NPMASS. Characterization of the devices were carried out at CeNSE, IISc, Bangalore. Figures on left and right sides show the SEM picture and the simulated results respectively.



Manuscript under preparation.



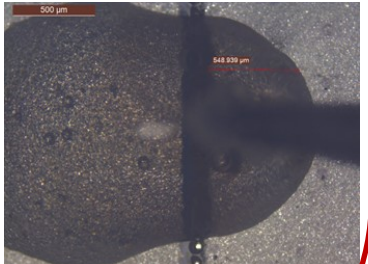
Tri-axes Accelerometer: The design and simulation of Tri-axes Accelerometer using SOI-MUMPS process flow was done at NMDC-REC. The devices were fabricated by SOI-MUMPS foundry at MEMSCAP Inc. through NPMASS. Characterization of the devices have to be carried out at CeNSE, IISc, Bangalore. Figures on left and right sides show the SEM picture and the simulated results respectively.



Presented at ICMEMSS 2014.



Digital Microfluidics: The design for digital microfluidic device by electro wetting on dielectric (EWOD) was done at NMDC-REC. The devices were fabricated at C-MET, Pune using Low Temperature Co-fired Ceramic (LTCC) Technology. Wires were soldered to contact points on the bottom electrode array and terminated in a 10-pin IDE socket. A conducting wire clipped to the hardened silver paste on the ITO sheet provides electrical connection to the ITO top electrode.



Presented at ICMEMSS 2014.

People @ CEMM

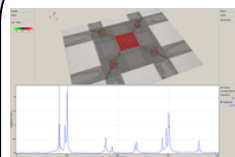


CENTRE OF EXCELLENCE IN MEMS & MICRO-FLUIDICS RAJALAKSHMI ENGINEERING COLLEGE CHENNAI - 602105

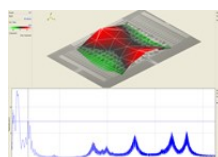
FACILITIES

- ♦ Clean Rooms
- ♦ Semiconductor Wet Lab
- ♦ Thin Film Deposition
- ♦ UV exposure system
- ♦ Electro-plating bath
- ♦ High Resolution Microscope
- ♦ Prog. Syringe Pumps

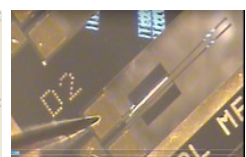
FABRICATED DEVICES



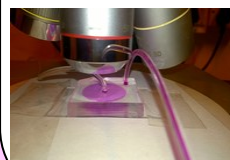
Accelerometer



Gyroscope



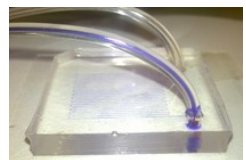
Micro Tweezers



Micro Reactor



Digital Micro-fluidics



Micro Mixers

ACTIVITIES

- ♦ Sponsored Research Projects
- ♦ Consultancy Projects
- ♦ Training Programs

CONTACT

Dr. L. Sujatha,
Head, Centre of Excellence in MEMS & Micro-fluidics,
Rajalakshmi Engineering College, Chennai - 602105
E-mail: sujatha.l@rajalakshmi.edu.in;
Phone: 044-3718 1044