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IISc Bangalore

INDIAN NANOELECTRONICS USERS PROGRAM
CENTRE FOR NANOSCIENCE AND ENGINEERING (CeNSE)
Indian Institute of Science, Bengaluru-560012

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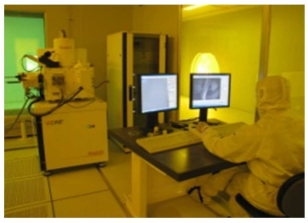
The National Nanofabrication Centre (NNFC), a part of Centre for Nano Science and Engineering (CeNSE) consists of cleanroom of 14000 Sq. ft area comprises of 8000 Sq. ft of Class 1000 and 2000 Sq. ft Class 100 for Lithography.

Capabilities of the Cleanroom

Lithography

- **Laser writer** for mask making and direct writing with 1µm minimum feature size
- **Optical lithography** double side mask aligners (EVG & SUSS) with 1.0µm feature size capability
- **Electron Beam lithography** tools (PIONEER & ELINE) with a minimum feature capability of 6nm, e-beam induced deposition and etching



Diffusion

- Multi stack, sophisticated high temperature furnaces for thermal oxidation, sintering and low pressure CVD **(LPCVD)** capability to grow Poly-Si doped and un-doped, SiGe, Si_3N_4
- Gallium Nitride (GaN) Metal Organic CVD (**MOCVD**)
- RTP System for annealing oxidation & nitridation for Silicon, SiGe, SiC, GaN etc.
- **induced deposition and etching**

Plasma Processing

- SPTS **DRIE** (4 inch capability): Etches up to 400 microns with an etchrate of ~20microns/min
- Oxford **Cl RIE** (6 inch capability): For etching metals, Gases connected: O2, Ar, N2, H2, Cl2, BCl3, CH4,HBr,SF6, CHF3
- Oxford **F RIE** (6 inch capability): For etching non-metals, Gases connected: O2, Ar, N2, SF6, CF4, CHF3,C4F8
- Oxford **PECVD** (6 inch capability): Films deposited: a-Si, PSG, BPSG, Si3N4, SiO2, SiC and SiGe, Temperature upto 400 Deg C
- Beneq ALD (8 inch capability): For depositing thin layers of Al2O3 and TiO2

Thin Films Deposition

- Two **RF sputter** deposition tools one dedicated to dielectric material sputtering and the other for other materials including variety of metals and mixed elements
- **Electron beam evaporation** for more than 50 different material deposition

In-line Characterization

- Characterization tools like **Ellipsometer** (to measure deposited film thickness), **Four probe measurement** (to measure sheet resistance), contact less hall measurement and **Dektak** (to measure step height after etching)
- Prober to measure IV, CV

Wet Chemical Processing

- CMOS precleaning and oxide/nitride etching, MEMS Silicon, oxide and nitride etch, Metal etch, Solvent clean, Au electroplating, general wafer clean and HF vaporizer etch

In House Equipment Development

- **Critical point drier** (3 inch capability): Uses liquid carbon dioxide to reduce striction and release MEMS structures
- **5 target Sputtering system** & **Pulsed laser deposition**
- Tempress furnaces (3 inch apability): Semiclean/ Au contaminated furnaces for annealing using FG, O2, N2 and Ar

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