

NanoFab at the University Ottawa

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Advanced Research Complex (ARC)

- \$100M building dedicated to research that opened in September 2014
- Home to the NanoFab Core Facility
 - ARC 329, ARC 330, ARC 333
- ARC was constructed with research in mind:
 - **The slightest vibration can affect laser experiments**
 - Built on anti-vibration floating floors
 - Raft slabs anchored by concrete-filled steel piles driven into the bedrock
 - If the building shakes, the slab stays put
 - **No ambient light which can affect laser experiments**
 - Some labs are nestled into the slope of a hill
 - **Labs are equipped with diffusers**
 - Push the air sideways (instead of downward) to avoid disrupting sensitive lasers
 - **Air pressure**
 - Clean Rooms kept at a positive pressure
 - Air leaks out of the labs instead of unfiltered air coming in

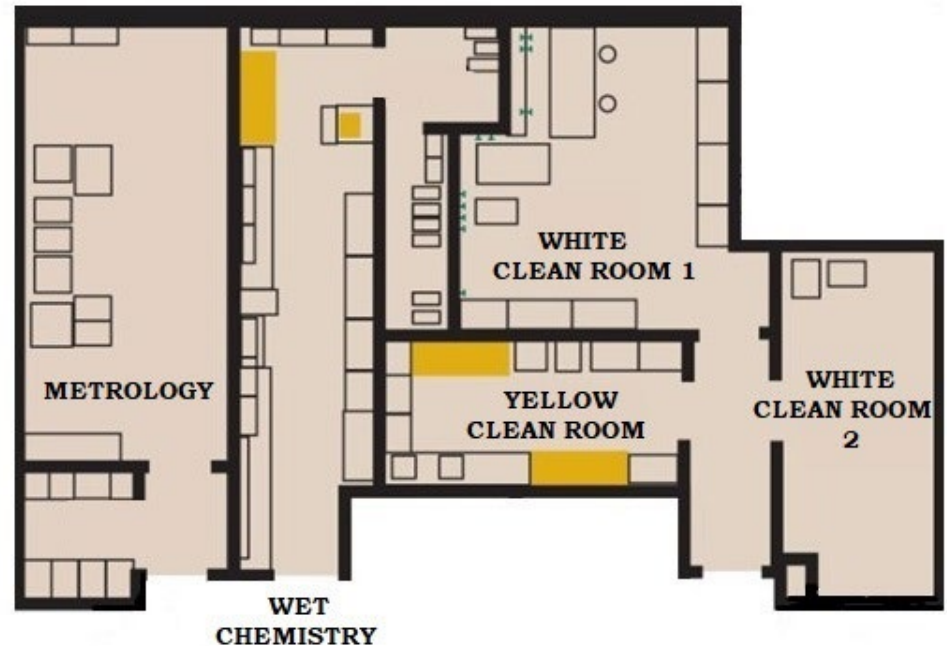


NanoFab

- Only open facility in Ottawa with a nanoscale focus
 - Complementary to existing facilities at local universities and government labs
- Open for collaboration with academia (professors, students, PhD's), government and industry, with open access and fee-for-service options for both internal and external users
- Staff: Director, Administrative Assistant, Lab Technologists
- Emphasis on nano-structuring and nano-characterization:
 - Integrated optical structures
 - Lasers and biosensors
 - Waveguides
 - Metasurfaces
 - Photodetectors
 - Modulators
- NanoFab capabilities:
 - Processing of up to 4" diameter wafers & pieces
 - Electron-beam lithography
 - Focussed ion beam milling
 - Microscopy
 - Material etching
 - Material deposition
 - Back-end processing
 - Optical parameter characterisation

NanoFab Facilities

- **Clean Room – ARC 333** (136 m²)
 - Fabrication and characterization
 - Yellow Clean Room & White Clean Rooms (x2)
 - Class 10,000
- **Wet Chemistry lab – ARC 330** (43 m²)
 - Back-end processing
- **Metrology lab – ARC 329** (55 m²)
 - Characterization and back-end processing



NanoFab – Clean Rooms



Vestibule for gowning up



Yellow Clean Room



White Clean Room 1



White Clean Room 2

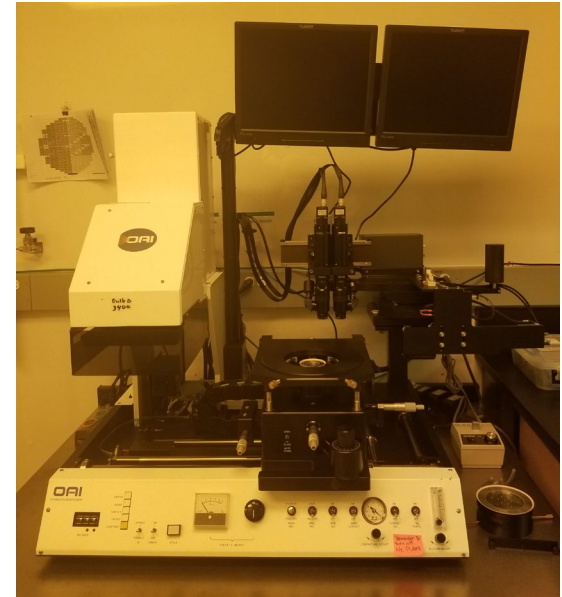
NanoFab – Yellow Clean Room

Used for fabrication and lithography work – no UV light



Other Tools for Resist Processing:

- Vacuum curing oven
- HMDS and image reversal oven
- Spinner & Hotplates
- Glove Box
- Ultrasonic Bath



Mask Aligner - OAI Model 204IR
Used for Optical Lithography

NanoFab – White Clean Room 1

Used for fabrication and characterisation



Raith Pioneer SEM + EBeam
Electron-beam lithography and
Scanning electron microscope



Angstrom Nexdep Evaporator
Evaporation and chemical
vapour deposition



SAMCO RIE-110ip Etching System
Inductively coupled plasma
reactive ion etching (Si and III-V)



Other fabrication tools:

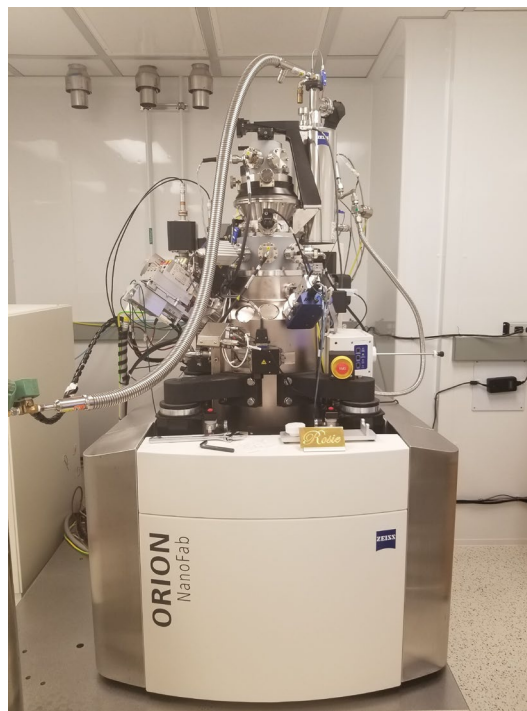
- SAMCO RIE-10NR Etching System (Reactive ion etching - Polymers & dielectrics)
- Oxygen Plasma Etcher
- Material Sputtering System – Quorum 150R
- Rapid Thermal Annealing System (150 to 1150 °C)

Other characterisation tools:

- Dektak Profilometer (surface roughness)
- Zeiss Axio Imager (for optical microscopy)

NanoFab – White Clean Room 2

Used for fabrication and characterisation



ORION NanoFab HIM/FIB

Focused ion beam milling &
Helium ion microscopy
(He / Ga columns)



AFM Park NX10

Non-contact Atomic force microscopy

Other fabrication tools:

- AML-AWB Wafer Bonder

NanoFab – Wet Chemistry Lab

Back-end processing for sample preparation

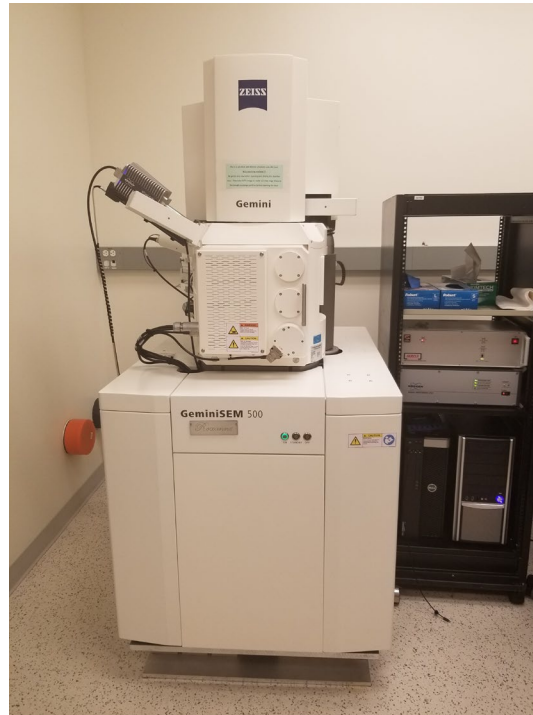
Tools:

- High Precision Dicing Saw
- Polishing Machine - Ultratec
- Polishing / Grinding station – Allied High Tech
- Solder Reflow Station
- Fumehood
- Electroplating System



NanoFab – Metrology Lab

Used for characterization and back-end processing



Zeiss GeminiSEM 500

Scanning electron microscope with
Bruker EDS capabilities (Quantax)



AFM Bruker Dimension Icon

Atomic force microscopy
for larger samples

Other characterisation tools:

- Metricon
 - Refractometer – measures thickness and refractive index
- Ellipsometer - Horiba UVISEL 245-2100 nm
 - For scanning spectroscopie - thin film characterization

Other back-end processing tools:

- West Bond Wire Bonder