The Integrated Nanomaterials Laboratory (INML) is a state-of-the-art nano- materials synthesis and characterization facility. INML addresses the critical technological needs of the future through material development as we integrate nanoscience with disciplines such as electronics, photonics, renewable energy, chemistry, biology, and physics. The extensive technological advances made by the INML particularly in the areas of integrated III-Sb/CMOS optoelectronics, infra- red photonics, and electronics form the basis of a large number of our on-going partnerships and collaborations.

Molecular Beam Epitaxy

Integrated NanoMaterials Laboratory

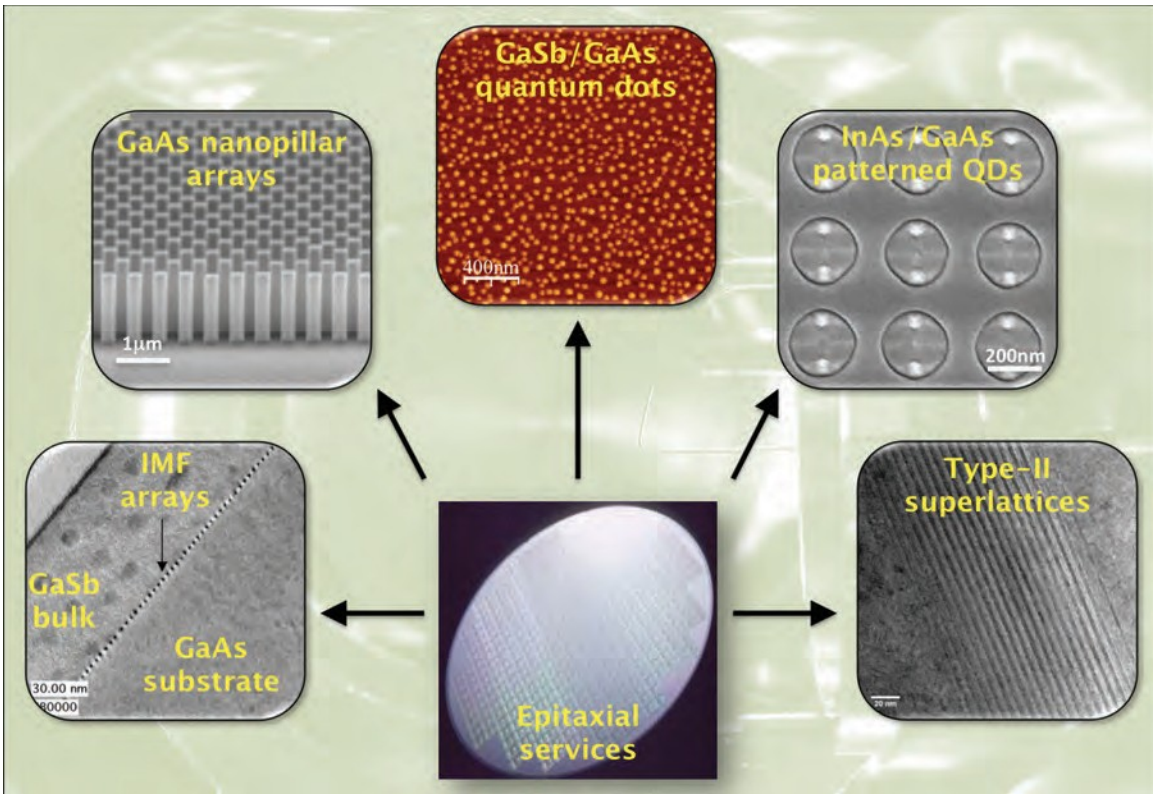
INTEGRATED NANOMATERIALS CORE LAB

At-a-Glance

- Semiconductor nanomaterials synthesis & characterization facility
- III-As/Sb and III-N MBE epitaxial growth foundry services
- High quality alloys for electronic / photonic devices
- integration of dissimilar materials for novel applications
- Work closely with ISNC cleanroom and NPC at CNSI

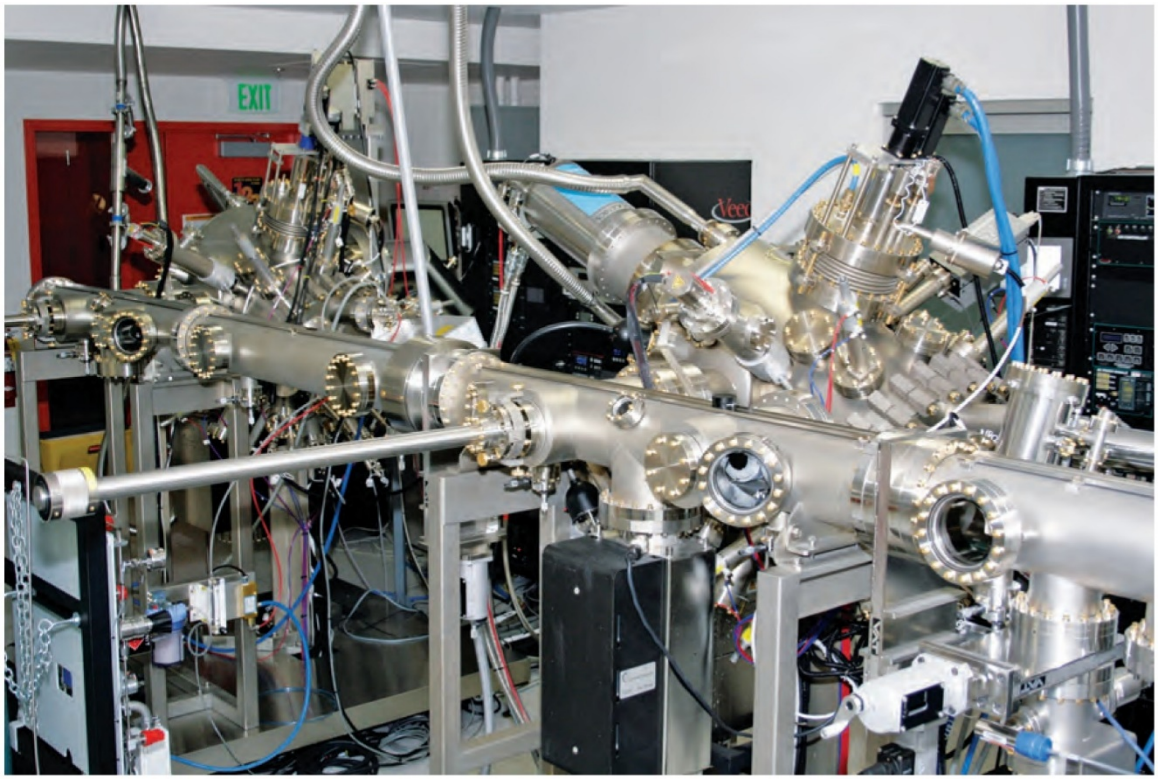
Epitaxial services and research expertise

INML provides epitaxial services for a wide array of research clients, from academic groups both here at UCLA and around the world, to national laboratories and many partners in industry. INML grows III-V and III-N compound semiconductor materials in ultra high vacuum (~10^{-10} torr) with emphasis on purity, control, and atomic-layer precision. nanomaterials and nanostructures grown in INML are used in lasers, solar cells, detectors, transistors, modulators, and a wide range of other electronic and photonic devices.



Molecular Beam Epitaxy (MBE) facilities

Featuring two interconnected Veeco GEN-930 MBE systems, the INML is equipped with the material synthesis and growth-monitoring tools necessary to fabricate a wide range of III-V and III-N compound semiconductor nanostructures.



III-N chamber

- N plasma source with RF generator
- Fully automated N gas delivery system
- High T substrate heater -1200°C
- Emissivity correcting optical pyrometer
- Up to 3" diameter wafers
- RHEED for real-time in-situ monitoring

III-As/Sb chamber

- Group III: In, Ga, Al effusion cells
- Automated As and Sb valved crackers
- Dopants: Si, Te, and Be cells
- RH EED for real-time in-situ monitoring
- KSA400 software for image/video analysis
- Automated growth control - Molly

Characterization facilities

Optical characterization:

Micro PL with ARS CS-204 cryostat (10K), excitation lasers (402 nm-1300 nm), OMA-V 2D InGaAs CCD array, Nicolate 8700 FT-IR. PicoHarp 300 TCSPC Super-K EXW-12 laser (400-2200 nm, 2ops)

Device I-V and C-V characterization:

Agilent 4156C parameter analyzer, Agilent E4980A (20Hz-2MHz) precision LCR meter, Lakeshore TTPX cryogenic probe station.

Nomarski phase contrast microscope:

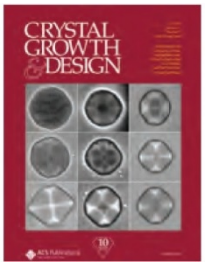
High-resolution digital camera, control software, and objectives up to 100X magnification.

Photovoltaic characterization:

Newport one-sun solar simulator, Newport QE/IPCE measurement set-up (QE-PV-51).

Impact on research community and publications:

Nature Communication Scientific Reports ACS Nano, Nano Letters, Physical Review B, Applied Physics Letters, IEEE Photonics Technology Letters, Applied Physics Express, Journal of Applied Physics D: Applied Physics, Journal of Nanoscience and Nanotechnology, Nanoscale Research Letters



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