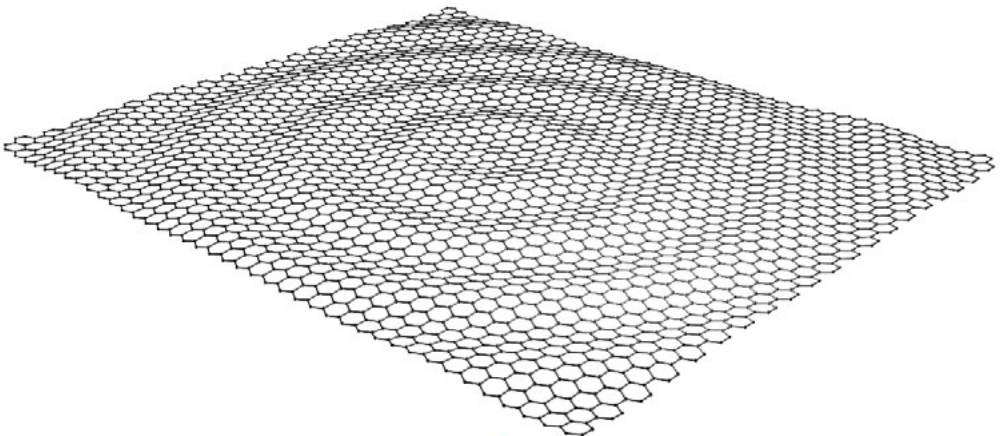


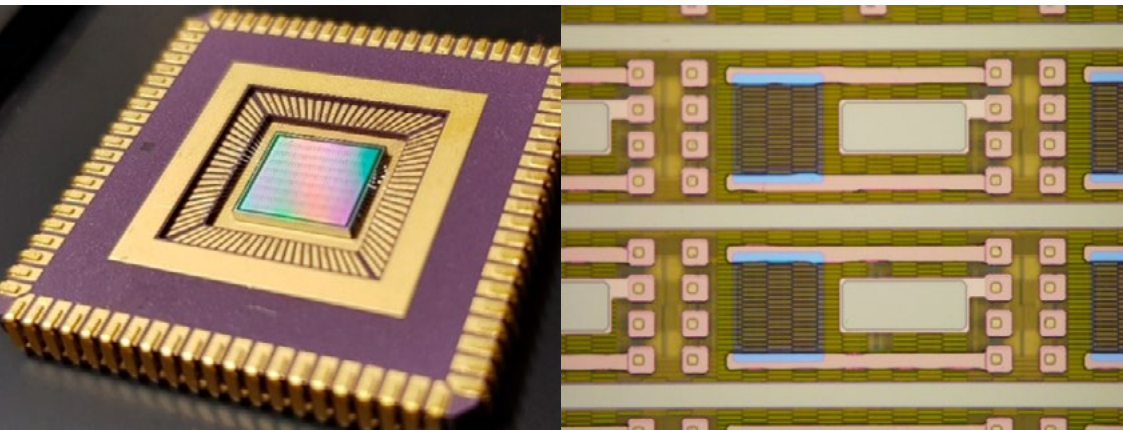
2D materials and graphene

R&D services of process development and processing of devices including 2D materials and graphene. In Micronova, VTT has the largest in-house R&D cleanroom in the Nordic countries along with other characterization facilities. This allows us to offer you the full development cycle from material characterization, process development, device innovation, and prototyping to small scale manufacturing.

We have capabilities for designing and manufacturing devices with field effect mobilities of over $1500 \text{ cm}^2/\text{Vs}$, doping below 10^{11} cm^{-2} , and yields of over 90%. Graphene based sensors can be used in applications such as biosensors, radiation detectors and quantum devices.



VTT also has know-how and experience in developing systems including IC readouts for multiplexed graphene sensors and full neuromorphic systems with integrated novel edge computing and in-logic memory devices.



CMOS integration

Our services in 2D materials and graphene include:

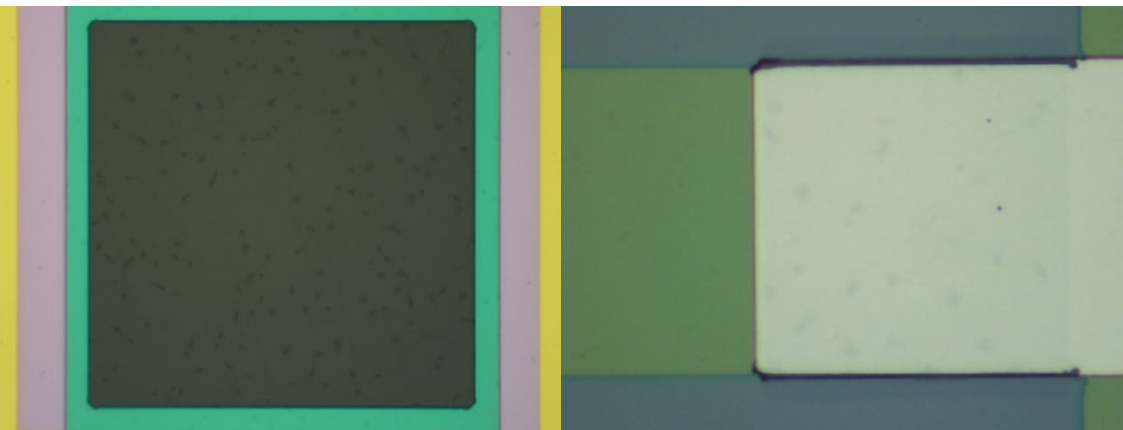
- Research and development – including for example custom CMOS design and post processing as well as graphene and 2D semiconductor integration
- Confidential contract research
- Material and device characterization
- Custom CMOS design and post-processing
- Graphene and 2D semiconductor integration
- MPW runs
- Small to medium volume manufacturing



Micronova cleanroom

Key processing capabilities

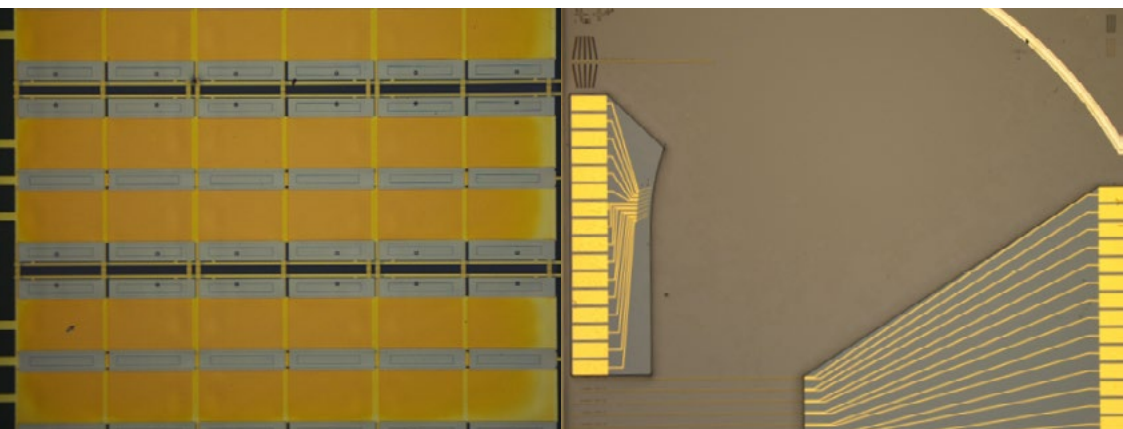
- Single layer and multilayer CVD graphene
- Lithography (E-beam and UV i-line & h-line)
- Metal contacts via evaporation or sputtering
 - Cr/Au, Cr/AuPd, Ti/Pd/Au, etc.
- Dielectric deposition (Al_2O_3 , HfO_2 , etc.) by ALD or evaporation
- Passivation (Al_2O_3 , Si_3N_4 , SiO_2 , polyimide, parylene)
- Wafer sizes up to 200 mm



Sensors

Characterization possibilities

- Atomic force microscopy (AFM)
- Scanning electron microscopy (SEM)
- Scanning micro-Raman
- Wafer probing (vacuum, ambient and inert)



Flexible substrates

Photonics



VTT

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