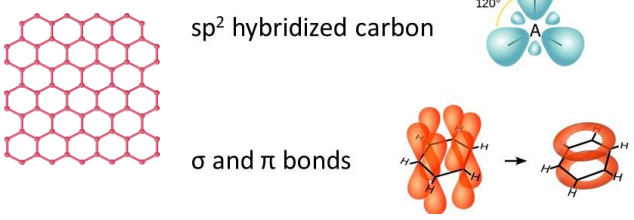
Graphene based bio/chemical sensors

Graphene is a monolayer of carbon atoms, tightly bound in a hexagonal honeycomb lattice. Three of the four outer-shell electrons of each atom in a graphene sheet occupy three sp^2 hybrid orbitals forming σ-bonds.

The remaining outer-shell electron occupies a p_z orbital that is oriented perpendicularly to the plane. These orbitals hybridize together to form two half-filled bands of free-moving electrons, π and π∗, which are responsible for the most of graphene's notable electronic properties.

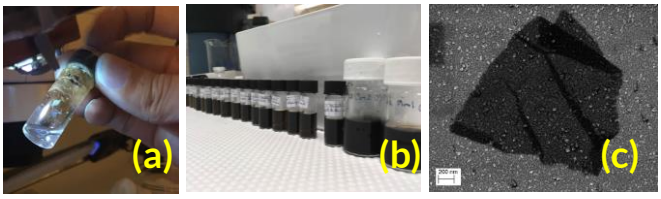
https://en.wikipedia.org/wiki/Graphene



Graphene based sensors benefit from the advantages of graphene, such as large surface-to-volume ratio, unique optical properties, excellent electrical conductivity, high carrier mobility and density, high thermal conductivity and many other attributes.

Collaborate with RISE to assure high quality and trusted sensors

Department of Smart Hardware at RISE has expertise in nano/micro fabrications and sensor technology including graphene-based sensors.



(a) and (b) chemically synthesized graphene quantum dots, graphene oxide (GO) and reduced graphene oxide (RGO) samples at RISE, (c) SEM image of a RGO flake.

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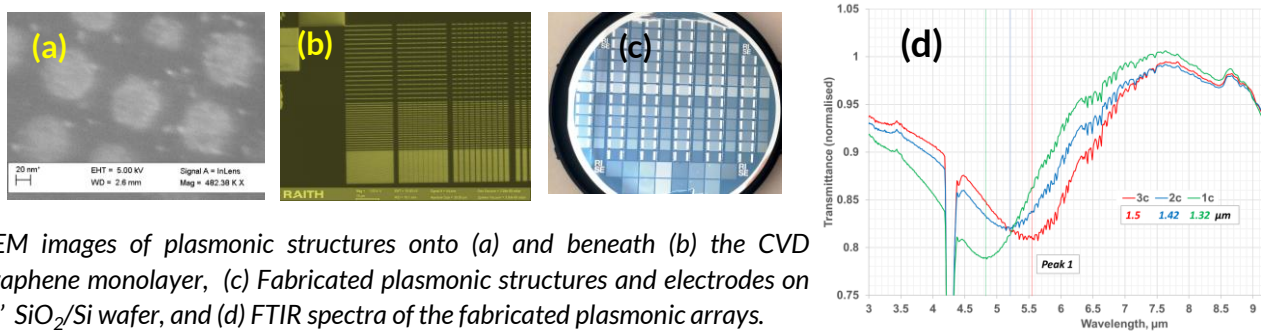
Expertise on CVD graphene-based IR photodetectors for CO_2 and alcohol sensing

- We have long-term collaboration on CVD graphene plasmonic structure-based CO_2 and alcohol sensors with SenseAir AB, https://senseair.com/ . This industrial partner is a leading global provider of air and gas sensing technology with vision to sense of air by the best measurement solutions, service and intelligence.
- Teaming with Institute of Solid-State Physics (ISSP), Latavia through EU Camart^2 project strengthen our technology platform in this area, https://camart2.eu/en/regional-network/



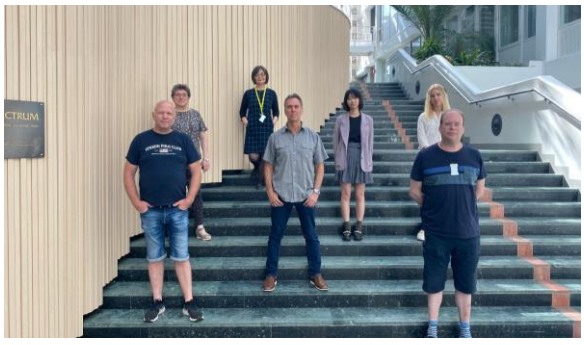
SEM images of plasmonic structures onto (a) and beneath (b) the CVD graphene monolayer, (c) Fabricated plasmonic structures and electrodes on 4" SiO_2/Si wafer, and (d) FTIR spectra of the fabricated plasmonic arrays.

Competence/capabilities on bio/chemical sensors

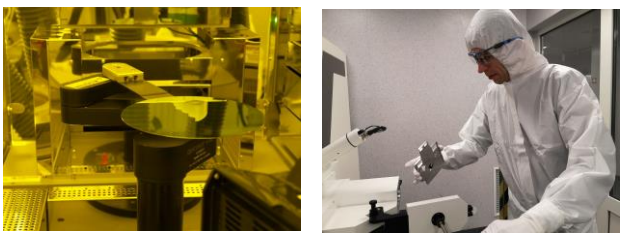
- Amphetamine and cocaine sensors using large area CVD mono layer graphene and graphene quantum dots through collaboration with Swedish National Forensic Center (NFC).
- Glucose sensors utilizing chemically synthesized GO and RGO, as well epitaxy formed graphene-on-SiC substrate.
- Hybrids of graphene and ZnO tetrapod for dopamine sensing. The dopamine is one of important bio marks for early detection of Parkinson disease.
- Graphene on SiC membrane as thin ion transmission detectors to study the influence of low-dose particle radiation on living cells.

Offers/supports from RISE

- Support design, fabrication and verification of the graphene-based sensors; R&D development from laboratory up to pilot scale.
- Collaboration project(s) with national and international multi-partners across full value chain.
- Access to technique platforms and facilities: RISE graphene knowledge platform and Latvian-Swedish regional network in frame of EU Camart^2 project; Electrum and ProNano and ISSP cleanrooms, http://www.myfab.se/KTHRISE.aspx and https://www.ri.se/sv/test-demo/pronano and https://www.cfi.lu.lv/en/services/all-services/cleanrooms/



R&D team at RISE AB



Nano/micro fabrication facilities at RISE and ISSP

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