Final Press release

Nanonet-based sensors for medical applications

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All partners from the H2020 research project Nanonets2Sense joined their force to overcome one of the main roadblocks towards the widespread use of nanowires (NWs) in sensing applications: their integration cost. They explored a new approach, where random networks of NWs, called nanonets (NN), were used as sensing material. The starting breakthrough originated from their capability to obtain conducting NNs by sintering at less than 400°C. On this basis, an innovative concept for 3D sensor integration was developed. In order to demonstrate the potential of this approach, they targeted two possible applications: the detection of DNA strands in body fluids and of acetone in breath, as possible biomarkers in oncology or for sugar metabolism, respectively.

Nanonets were obtained by low cost nanowire growth and assembling. The controlled growth of both Si and ZnO nanowires was achieved, with independent control of diameter and length. By using nanonets as sensing material, our synergetic approach retains the advantages of NW properties without the associated technological burden. With a smart combination of bottom-up and top-down technologies and a low processing temperature compatible with CMOS, it allows 3D integration into a compact sensor, where the sensing element, which is exposed to breath or biofluids, is integrated above the CMOS detection circuit, which is protected.

With an estimated power consumption of only a few dozen µW, the fully integrated DNA sensor has the potential to become a disruptive technology. The project also demonstrated that NNs can be integrated on micro hotplates with an industrially relevant process and that the resulting devices are functional as gas sensors whilst operating at temperature up to 400°C. It also highlighted that the engineering of NN passivation affords a powerful avenue to tune gas sensitivity and increase sensor lifetime.

Nanonets2Sense is thus providing a completely new technological building block to enhance CMOS chips functionality with biosensing capability. The impact is enhanced by the fact that the approach is generic and can be adapted to a large variety of NWs and target molecules. Solely in the medical field, where the availability of biosensors at low cost is a key for the widespread diffusion of point-of-care devices, applications can be envisioned in the fields of therapy monitoring, pharmacogenetics or metabolic disorders and diet monitoring.

The H2020 Programme

H2020 is the short name for the Horizon2020 Programme for Research and Technological Development. This is the EU's main instrument for funding research in Europe beginning in 2014. The Nanonets2Sense is a Research and Innovation Action Project.

The Nanonets2Sense consortium partners:

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- Kungliga Tekniska Hoegskolan (Sweden)

European Academic and Scientific Association for Nanoelectronics:
- SiNANO Institute (France)

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For full project documentation please visit: www.nanonets2sense.eu