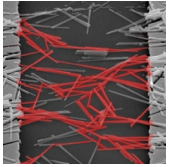


## ◆ Grenoble INP/FMNT

*Academic Lab*

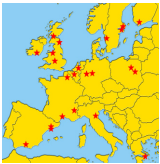
Project coordination



- Nanonets fabrication
- Nanonets bio-functionalization
- Device Characterization and Modelling

## ◆ SINANO Institute

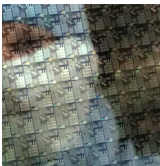
*European Nanoelectronics Association*



- Management and dissemination

## ◆ Kungliga Tekniska Högskolan

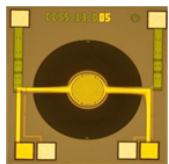
*Academic Institute*



- CMOS compatible process development
- Circuit design
- Demonstrator for biosensing

## ◆ ams Sensors UK Limited

*Private limited Company*



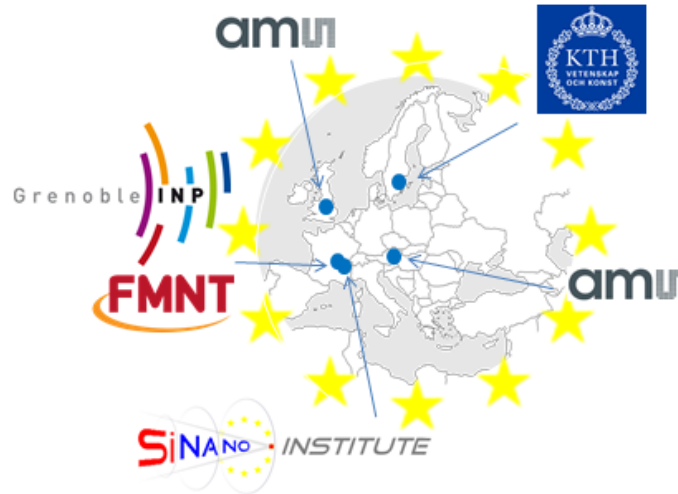
- Micro hot plates for gas sensing
- Demonstrator for acetone in breath

## ◆ ams AG

*Large Foundry*



- Wafers fabrication with dedicated CMOS readout
- Exploitation of results



**Contact:** Mireille Mouis, Coordinator  
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[contact@nanonets2sense.eu](mailto:contact@nanonets2sense.eu)  
[www.nanonets2sense.eu](http://www.nanonets2sense.eu)

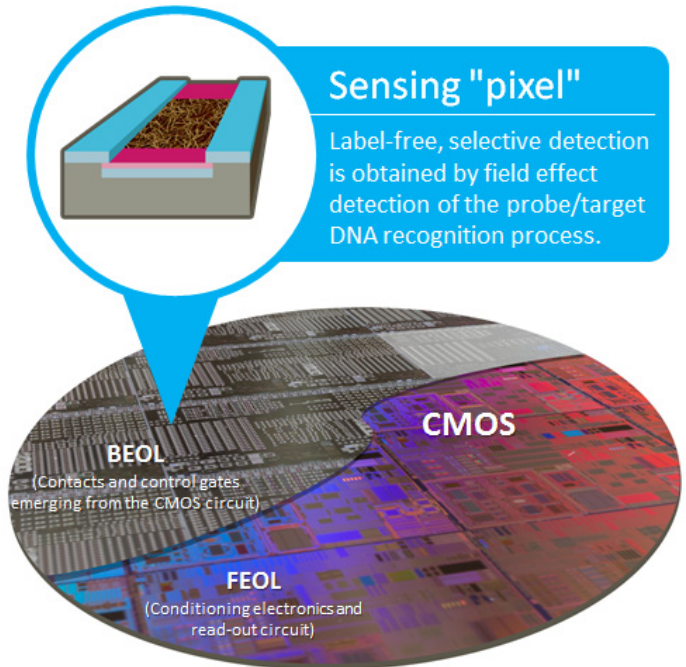
Join our **Nanonets2Sense LinkedIn Group**

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Edition January 2017

Credits: Nanonets2Sense & G. Passador

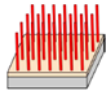
## Nanonet-based sensors for medical applications



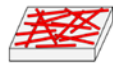
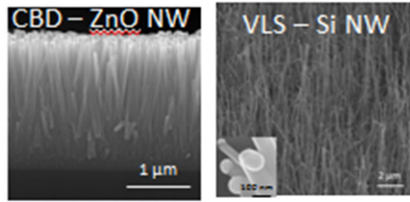
### Sensing "pixel"

Label-free, selective detection is obtained by field effect detection of the probe/target DNA recognition process.



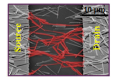


## NANOWIRES: Bottom up growth



## NANONETS: Random networks of sintered nanowires

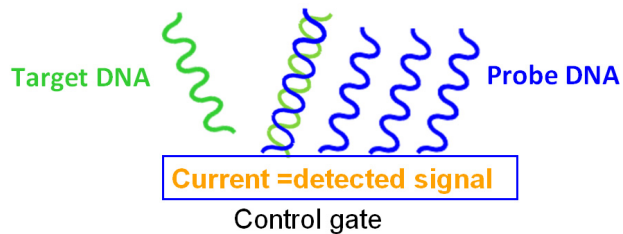
- Bottom-up fabrication by filtration followed by standard, low-cost, patterning and processing
- Benefits of thin crystalline nanowires with easy integration above CMOS wafers



## LABEL FREE SENSING: Field-effect detection

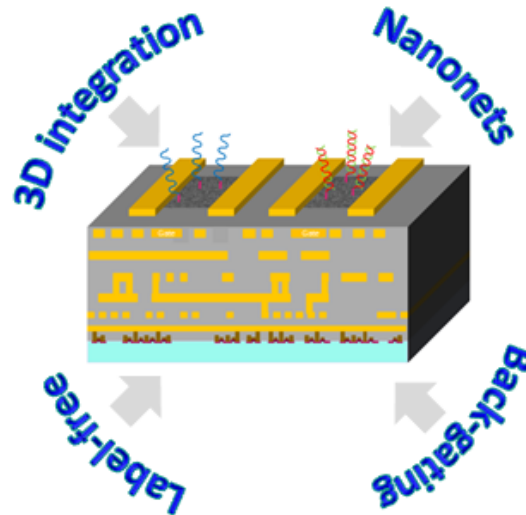
- Surface potential variation:** surface modification of ZnO nanonets under specific atmosphere e.g detection of target gas such as acetone
- Surface charge variation** e.g detection of hybridization of target molecules with probe DNA by functionalized Si Nanonets

### Hybridization leads to change in surface charge



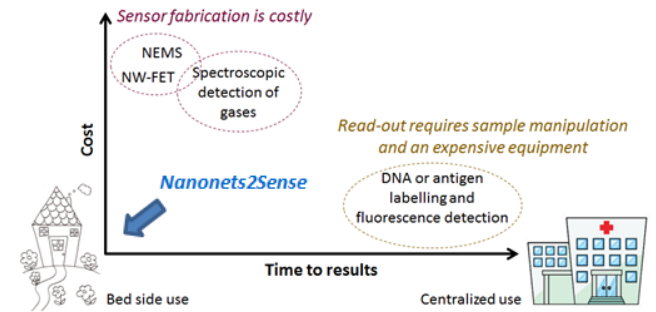
## A new technological brick for 3D integration of sensors

- Small footprint
- Compact
- Co-design, optimized read-out
- Adapted to multiplex detection with different target molecules
- Nanophysics with microtechnology
- Crystalline nanowires as sensing element, sensitivity
- Easy adaptation to other target molecules



- Fully electrical
- Direct read-out, no expensive detection equipment or detection system integration
- Robust
- Biosensing: functionalization is carried out on completed device
- Breath analysis: nanonets can be fabricated with a variety of nanowires
- Optimized operation point: sensitivity and power consumption
- Reduced operation temperature for metal oxide gas sensors

## Low-cost smart sensors for pre-diagnostic or monitoring at bed side (Point of Care)



## Two model molecules are used to evaluate the potential of this generic technology.

- Gaseous phase:** breath biomarkers such as acetone for diabetes prediagnostics.

ZnO nanonets on micromachined heater



- Liquid phase:** Biomarkers such as micro RNAs, hormones, proteins (in sweat, urine, blood...)

Functionalized Si Nanonets

