

## Detection of Neurotoxic Gases by Functionalized Silicon Nanowire Field-Effect Transistors

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### Abstract

The threat of a chemical attack on homeland and military forces continues to grow and recent examples such as the terrorist attack of the Metro of Tokyo have clearly shown that organophosphorus agents (OPs) are powerful neurotoxic molecules that can actually be used as weapons of chemical terrorism. Some sensors are commercially available to detect warfare gases, however they suffer from some intrinsic defects that reduce significantly their interest in some specific kinds of operation. Up to now, there is still a lack of supersensitive and specific autonomous tiny sensors.

New sensors based on one-dimensional semiconducting nanomaterials like silicon nanowires have been chemically functionalized with tailor-made molecules for detection of traces of toxic gases. In particular, a chemical receptor specific to traces of neurotoxic OPs like Sarin has been synthesized and grafted to sensitive nanomaterial based electrical devices.

These results show that it is possible to detect very efficiently sub-ppm traces of OPs with high selectivity by monitoring the Drain-Source current of the SiNW-FET at an optimum back gate voltage as a function of time.

We will present results starting at the nanoscale using functionalized nanomaterials, up to their integration in an autonomous demonstrator.[1-5]

### References

- [1] Clavaguera S., et al., *Angewandte Chemie Int. Ed.*, **49** (2010) 4063.
- [2] Delalande M., et al., *Chemical Communication*, **47** (2011) 6048.
- [3] Passi V., et al., *IEEE Electron Device Letters*, **32** (2011) 976.
- [4] Clavaguera S., et al., *Talanta*, **85** (2011) 5242.
- [5] Patents to CEA

### Figures

