

## Potentiometric nano-biosensors

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### **Background and state of the art**

The combination of nanotechnology and biosensors has led to a true revolution in the bio-analytical field. From one side, new materials with extraordinary sensing abilities have allowed to discover new insights on the mechanisms and processes of living organism. From the other, nanomaterials have significantly improved existing methods of determination. Today, methods that are more sensitive, faster, more robust, with spatial resolution, simple to operate and at a lower cost are available thanks to the use of novel nanosensors. A good example is the use of carbon nanotubes (CNT) as ion-to-electron transducers in potentiometric electrodes, which allowed significant improvements in both, the performance of the electrodes and the range of applications. Today, CNT based potentiometric sensors for the determination of ions, biomolecules and even living bacteria have been reported.

This search is far from over. As the use of these new sensors broadens and deepens our understanding, more questions emerge that claim for better analytical tools. The field of CNT based potentiometric sensors has generated significant improvements during the last years, but more discoveries and new developments are still needed, particularly in the bio-analytical field. The use of CNT based sensors –either alone or as detector of a more complex system– for the determination of organic and biological substances is just beginning, and it has still a huge potential for development.

### **Aim of the work**

In this work will be focused on the exploration of the use of CNT based potentiometric sensors for the simple, robust and sensitive determination of biomolecules with physiological relevance. Metabolites found in urine and saliva will be first targeted. Factors affecting the sensitivity, selectivity and stability of the sensors will be evaluated. Ideally, the sensors developed in this work will be adapted to the development of low cost, portable sensing platforms.

## Candidate profile

This work has a very strong experimental bias. Therefore, it is expected that the ideal candidate is a challenging, hands on, self motivated person, with curiosity and willingness to explore, and skills and ability for building experimental systems. Proficiency in chemistry is essential, and basic knowledge on data processing techniques (or willingness to learn it) will be an important advantage.

## Recommended reading

- 1) Lode, P. von *Clinical biochemistry*. **2005**, *38*, 591-606.
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- 5) Zelada-Guillén, G. A. Riu, J. Düzgün, A.; Rius, F. X. *Angewandte Chemie International Edition*. **2009**, *48*, 7334-7337.
- 6) Wang, J. *Electroanalysis*. **2005**, *17*, 7-14.
- 7) Rusling, J. F. **2003**, *179*, 169-179.