

Tailored three-dimensional bioplatforms for ultrasensitive analytical devices

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Abstract

The talk will be an overview of our research on the development of novel fit-for-purpose sensing tools, which exploit the combination of hybrid nanoscale building blocks, novel bioreceptors and their site-specific immobilisation, new electrochemical techniques and mathematical data processing.

We have special interest in the use of nanochannels embedded in chemically and mechanically stable synthetic substrates, as novel materials to design nanostructured biosensors. Materials that can easily tailor their nanochannel size and depth, nanochannel distribution and functionalisation, are highly desired. Porous silicon (pSi) is well suited for developing label-free optical biosensors, but its use in electrochemical biosensors has not yet been exploited. Our focus is on creating the next generation of highly versatile electrochemical biosensing platforms by harnessing Si fabrication methods and the unique chemical and morphological properties of this material.

Si nanostructures, including porous membranes, nanopore arrays and nanowires, present major advantages for electrochemical analysis, such as high surface-to-volume ratio, unique charge transport properties, control over nanochannel size, even in multilayered configurations, and ease of surface modification and control of the electric properties. This new set of pSi-based nanostructures is designed to unlock new sensing paradigms and potentially achieve greater sensitivities and shorter analysis times, providing solutions for environmental, food safety and healthcare issues.

Scientific Biography

Beatriz Prieto Simón is a Senior Research Fellow at the *University of South Australia*. She received her PhD in chemistry from the *Autonomous University of Barcelona* in 2005. Beatriz conducted 3-year postdoctoral research at the *University of Perpignan (UPVD, France)*, where she initiated a research line on biosensors for the detection of mycotoxins. Then, she undertook a fifteen-month postdoctoral stay in Japan, at the *Tokyo University of Technology* as a Japan Society for the Promotion of Science (JSPS) Fellow. After returning to the *UPVD* to continue her postdoctoral research and lecturer activity, she started a Juan de la Cierva postdoctoral fellowship awarded by the Spanish Ministry of Education and Science, at the Nanobioengineering Group, *Institute for Bioengineering of Catalonia*, Barcelona. At present, she is leading a research line on nanostructured electrochemical biosensors at the *University of South Australia*. She has made significant contribution to the fields of biosensors, biomaterials, nano- and biotechnology, and the crossing over into areas such as clinical diagnostics, environmental control and food safety. Currently her research is focused on combining the advantages of novel nanostructured materials, site-specific immobilisation of bioreceptors, and new electrochemical techniques, to provide platforms for sensitive and selective multiplexed detection which could be used as point-of-care devices.