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IL DIPARTIMENTO DI SCIENZE MOLECOLARI E NANOSISTEMI

ORGANIZZA LA CONFERENZA :

Plasmonic nanobiosensors: From therapeutic drug and environmental monitoring to optophysiology of living cells

Prof. Jean-François Masson

Université de Montréal - Canada

March 22nd, 2018 at 14:30

Room B, Zeta Building - Campus Scientifico, Via Torino

Abstract

This presentation will provide an overview of our research activities in plasmonic nanobiosensing. Our research lies in the areas of plasmonic materials, low-fouling surface chemistry and instrumental design for biosensing. This presentation will focus on applying these concepts for several classes of sensors for monitoring biomolecules, therapeutic drugs, pheromones and for environmental contaminants. We have developed a SPR and LSPR sensing platform based on a small and portable instrument that can be field-deployed. In the first example, this SPR chip was integrated with a RDX-selective molecularly imprinted polymer to detect RDX at ppb levels directly in natural waters. The system was deployed to a Canadian army base for monitoring the level of RDX in proximity of training grounds. This system was tested on several trips in different environmental conditions and results were in good agreement with HPLC performed in a laboratory. Clinical sensing in crude biofluids is a common challenge to different biosensing platforms. To prevent nonspecific adsorption of serum, a series of peptide monolayers were synthesized and tested in crude serum. Based on this, competition assays were validated for therapeutic drug quantitation, such as methotrexate with the SPR sensors. The methotrexate assay was tested at a local hospital and was cross-validated with the current state-of-the-art FPIA analyzer commercially available. Lastly, we are currently exploring the concept of optophysiology using plasmonic nanopipettes for monitoring living cell secretion events. Due to the lack of analytical techniques for detecting metabolites near living cells, developing tools to monitor cell secretion events remains a challenge to overcome in chemical analysis. Plasmonic nanopipettes were developed based on the decoration of patch clamp nanocapillaries with Au nanoparticles. The plasmonic nanopipette is thus competent for dynamic SERS measurements in the liquid environment near cells. This nanobiosensor was tested with the detection of small metabolites near living MDCKII cells and of neurotransmitters released by neurons.

Gli organizzatori
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