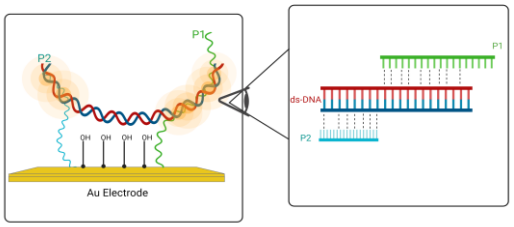
Electrochemiluminescence-based biosensor: from academic curiosity to an industrial success

Abstract:

Electrochemiluminescence (ECL) is a leading technique in bioanalysis.[1] Since the excited species are produced with an electrochemical stimulus rather than with a light excitation source, ECL displays an improved *signal-to-noise* ratio compared to photoluminescence.[2] The electrochemically-induced way to generate luminescence signal allows to obtain sensors with low background, high sensitivity, good temporal and spatial resolution, robustness, versatility, and low cost. The unique analytical performances in terms of high detectability of conventional chemiluminescence (CL) are retained and, in addition, the electrochemical trigger of the reaction allows controlling the time and position of light emission. As a matter of fact, ECL has become a powerful analytical technique widely studied and applied both from the academic and industrial point of view. If we have a look at the last 20 years, the number of scientific publications focused on ECL research has been exponentially increased and commercial clinical analyzer, Elecsys®, is an industrial success with more than 150 immunoassays based on ECL technologies.

In the quest for ever-increasing sensitivities, ECL can ideally be coupled to nanotechnology for developing new systems and strategies for analyte determination. In this context, thanks to the combination of different nanomaterial we were able to *"fuel"* the generation of the ECL reagents and optimize its interaction with the dye reaching very competitive limits of detection in complexes matrix such as blood and urine. [3] Our last efforts have been focused also in the combination between ECL and microscopy for single cells analysis with high throughput and low detection limit [4] and for the point of care PCR-free Hepatitis B Virus determination.



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