Gold Nanoparticle-Oligonucleotides conjugates for LSPR detection of Anabolic Androgenic Steroids

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In the last decade, there has been an increased interest on the application of nanoparticles to enhance the features of the biosensors or to improve their performance. Nanoparticle-based optical biosensors, like those based on localized surface plasmon resonance (LSPR), have been proved to be suitable for the quantitative detection of chemical and biological targets[1-3].

Short DNA sequences have demonstrated to be useful as tools to facilitate biomolecule immobilization on microarray and sensor surfaces. Thus, proteins, antibodies or haptens can be immobilized onto solid supports[4,5] avoiding problems related to denaturation or lose of the activity due to the immobilization. Similarly, colloidal metal nanoparticles of different size, shape and material can also be immobilized on different supports using the DNA-directed immobilization strategy (DDI). Thus, DNA-microarrays can be the base for the site-specific immobilization of gold nanoparticle-oligonucleotide bioconjugates functionalized with complementary strands, allowing the fabrication of novel nanostructured surface architectures[6,7]. This strategy can further be used as a *top down* approach for the site-selective DNA detection through the hybridization with the corresponding targets, but also, to detect proteins or other biomolecules using the bio-barcode assay[8].

In this communication, we will present the work performed to develop a nanostructured LSPR sensor transducer using the DNA hybridization to specifically address gold nanoparticles to defined spots of a glass support. This has allowed the construction of homogenous and biofunctional nanostructured surfaces useful for the detection of interesting target biomolecules using the LSPR physical principle. As a proof of concept, we have used this approach for the detection of small molecular weight analytes at low μg L^{-1} level. The presented strategy may open the doors for an easy way to construct encoded multiplexed LSPR sensor transducers using the DDI method in combination with nanoparticles showing distinct optical properties.

References

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Figures

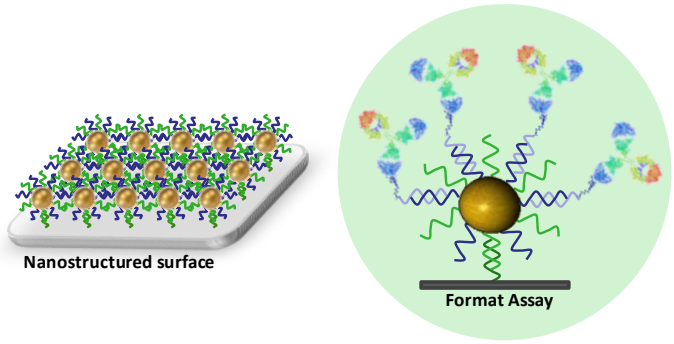

Figure 1: Scheme of this nanostructured surface and the format assay used to evaluate this platform as a LSPR transducer.