Nanoparticle-Based Biosensor: Encoding and Decoding Information with DNA Hybridization

M. Gaillard, J. Plain, and J. Proust

Light, nanomaterials and nanotechnology (L2n), Un. of Technology of Troyes, France

corresponding author: margaux.gaillard@utt.fr

Gold nanoparticles (GNP) are nanometer-sized particles of gold with unique properties that make them highly promising for numerous applications in diverse fields, such as medicine, biotechnology, chemistry, catalysis and photonics. In particular, GNP are used to develop biosensors [1], which are devices capable of detecting specific molecules in biological samples. GNP-based biosensors offer a number of advantages over traditional biosensors, such as greater sensitivity, selectivity and ease of use. In addition, GNP can be combined with DNA to encode information [2]. This can be used to create even more sensitive and selective biosensors, or to develop new methods for diagnosing and treating diseases [3].

The challenge of the project is to develop a technique to encode information in a nanoparticle-based ink and to be able to collect and read the coded information once deposited on a surface. We use DNA hybridization to ensure the selectivity of the recognition technique. In fact, by hybridizing nanoparticles on a surface using DNA coding and by collecting the spectral response of the nanoparticles, it is possible to detect and recognize the code. First, we verified our hybridization protocol by hybridizing DNA strands with fluorophores at their ends. Then, we immobilized GNP and Q dots on a glass substrate by DNA hybridization. Finally, we optimized the immobilization protocol using Surface Plasmon Resonance.

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