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FACULDADE DE CIÊNCIAS E TECNOLOGIA UNIVERSIDADE NOVA DE LISBOA

Chemistry Department

Localized Surface Plasmon Resonance study of DNA Hybridization events at the single particle level – Gold nanotriangles

REQUIMTE/Bionano@REQUIMTE

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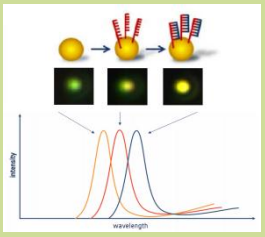
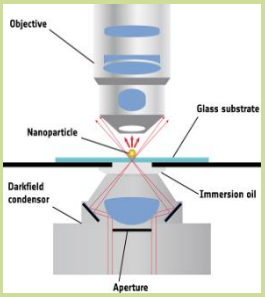
Objectives

Nanoparticle-based optical sensors allow for a quantitative detection of biological and chemical targets. The high sensitivity of gold nanoparticles to adsorbate-induced **changes in the dielectric constant** in the environment is the basis of this sensing principle. The combination between dark field illumination technique with **micro spectroscopy** is used to characterize the optical properties of single particles immobilized on borosilicate glass surfaces.
The focus of interest of the work is the use **gold nanotriangles** (AuNTs) as sensing platform for a label-free detection of **DNA hybridization events**.



Sensing principle



Dark field Micro Spectroscopy

Methodology

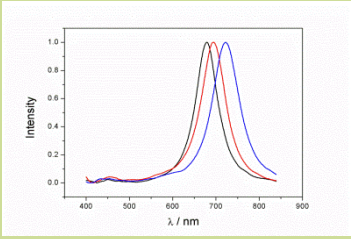
1.Synthesis of gold nanotriangles by a green-photochemical method, using a tin(IV) porphyrin (Quaresma, P. *et al*, Green Chem., 2009, 11, 1889–1893)
2. Cleaning/Activation/Silanization (APTES) and immobilization of AuNTs.
3. Immobilization of CTAB capped AuNTs on the chip.
4. Overnight incubation with the oligonucleotide.
5. Hybridization at room temperature with complementary and non-complementary targets.
6. Selection/Acquisition of 12 gold nanotriangle single spectra after NP (**black**) and DNA (**red**) immobilization and target hybridization step (**blue**).

Expected Results

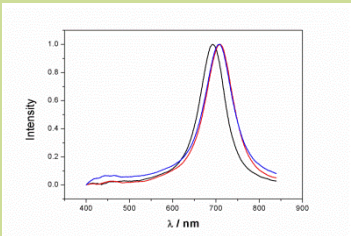
These gold nanotriangles served as plasmonic transducer for detecting DNA binding events:

- The change from the original capping (CTAB) and subsequent DNA capture resulted in an average LSPR shift of 16.3 ± 3.1 nm.
- After hybridization, the **complementary target** binds specifically to the oligonucleotide, originating a resonance shift of 33.6 ± 2.5 nm (relative to complementary DNA
- Since the **non-complementary target** is non-matching with the oligonucletide sequence, there is no binding and thus no LSPR shift is observed (0.98 ± 0.1 nm).

Complementary



Non-complementary



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