“Bio-Sensing: Optical or by Electronics?”

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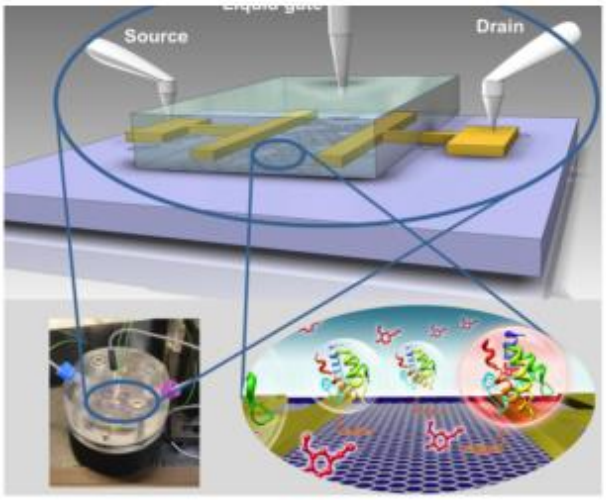
The race in Protein, DNA, or small molecule diagnostics between optical detection principles (fluorescence, surface plasmons, optical waveguides, etc.) and electrical/ electrochemical/electronic concepts is not decided yet. Both scientific communities continue to offer solutions for fast, multiplexed, simple and cheap detection of peptides, proteins, oligonucleotides, PCR amplicons, small molecules like odorants, etc. Most likely, the competition will never see a single winner that meets all needs because the different practical formats and boundary conditions for applications, as well as, market requirements may ask for specific and unique solutions that could be better achieved in one case by optics and in another situation by electronics.
Along these lines, we will briefly review the state of the art of both categories of diagnostics and will present a number of examples of what has been demonstrated for the sensitive detection of DNA by monitoring surface hybridization reactions of target strands binding from the analyte solution to surface-attached capture oligonucleotides. Other examples concern the quantitative monitoring of proteins, e.g., antibodies binding directly to the surface-immobilized antigen, or the detection of small analytes, e.g., odorant molecules recognized by odorant binding proteins immobilized on the transducer surface. A particular emphasis will be put on the physico-chemical principles of these surface recognition and binding (or dissociation) reactions in order to be able to develop criteria of how to optimize sensitivity, selectivity, etc.

Electronic Setup



Plasmon Optical setup