A localized surface plasmon sensor for early cancer detection (SPEDOC)

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Surface plasmon resonances (SPR) have become a standard tool for performing concentration analysis of biological samples, determining affinity constants of biomolecules or measuring chemical reaction kinetics. Commercial SPR systems are widely available and can be found in many modern bio-chemistry labs. Recent experiments suggest that using nanostructures exhibiting localized surface plasmon resonances (LSPR) could be the basis for biosensors of comparable or even better performace [1].

SPEDOC (Surface Plasmon Early Detection of Circulating Heat Shock Proteins) is a research initiative supported by the European Comission's 7th Framework programme that aims at combining the latest advances of nano-optics, optical manipulation and microfluidics with recent discoveries about Heat shock Proteins (HSP) to develop the precursor of future individualized cancer diagnosis and treatment follow-up devices.

COSINGO is a company that unifies great expertise in optical engineering, in applied research with optical technologies and long experience building optical sensors. For SPEDOC, COSINGO teams up with four research institutions from France, Switzerland and Spain; ICFO, UB, INSERM and EPFL.

The platform developed during this project will exploit the surface plasmon resonances supported by gold nanostructures integrated in a microfluidic environment to track HSP70 proteins in the peripheral blood. This innovative sensor should permit providing treatment to cancer patients at an earlier stage and at lower doses with the consequent decrease of secondary effects.

We will present the project objectives and show first results achieved with the first generation prototype of an optical detection platform (ODP) developed by COSINGO. This ODP is designed for the detection of proteins in solution and uses a PDMS microfluidic chip of the type shown in figure 1. The setup will be presented and results of the first experiments measuring the plasmon resonance shift of nanodimers (illustrated in figure 2) when exposed to solutions of different refractive indices will be presented.

The measurements are performed by data acquisition software using the centroid tracking method [2]. This allows for live monitoring of binding dynamics and greatly improves the sensitivity of the associated sensor.

References

[1] A.B. Dahlin, S. Chen, M.P. Jonsson, L. Gunnarsson, M. Käll, F. Höök, Analytical chemistry, **81** (2009) 6572-6580.
[2] A.B. Dahlin, J.O. Tegenfeldt, F. Höök, Analytical chemistry, **78** (2006) 4416-4423.

Figures

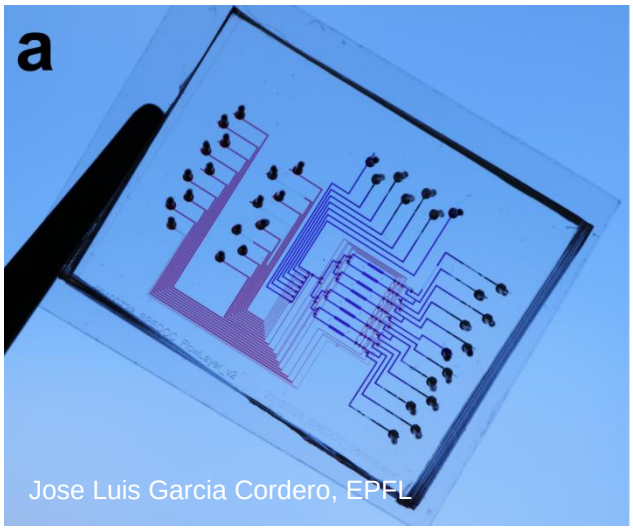

Figure 1: SPEDOC first generation microfluidic chip

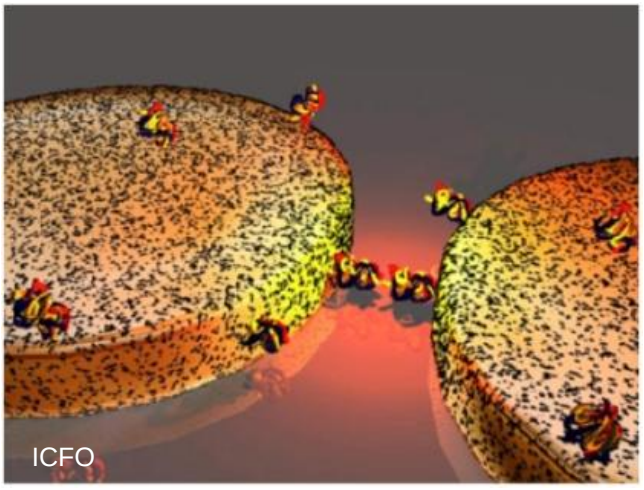

Figure 2: Illustration of functionalized nanodimers binding HSP70