A Nanostructured Thin Film Commercial LSPR Platform for Ultra-Sensitive Point-of-Care Diagnostics

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ABSTRACT

We present an optical platform for rapid point-of-care diagnostics based on a metallic nanostructured thin film that exhibits an enhanced Localized Surface Plasmon Resonance (LSPR). The optical biosensor is composed of a stable thin gold film that displays a color visible to the naked eye. The color of the film changes when a bioassay is performed on its surface and the change can be measured and quantitated with simple hardware. The color shift is dependent on the bioanalyte concentration, and this color change can be very large, i.e. surfaces can migrate from burgundy to dark-blue or even green. Further, these color changes can be precisely quantified. The precise quantification allows us to build dose-response curves and titrate unknowns.

The LSPR thin films are also compatible with various complex media - cell lysates, sera and whole blood - while also being impervious to extreme acidic or alkaline conditions.

The LSPR technology has been quantitated against ELISA in a series of models and has been shown to be more sensitive and faster, in the order of minutes vs. hours. We will discuss the physics behind the technology, its sensitivity and limits of detection. We will illustrate the films performance in various evolving diagnostic fields, such as predictive assays for cervical cancer, cardiac biomarkers, and the detection of low level toxins.

In conclusion, we will discuss how commercially available LSPR film technology can be integrated into economical multi-panel POC handheld devices for broad adoption in diagnostics.