# NANO-PARTICLE BASED PLASMONICS MICROSCOPY

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## 1.Introduction

Conventionally, microscopic biosensing was mostly achieved by dye labeling. However, despite of its extremely high sensitivity, dye labeling is not suitable for kinetic biosensing. Biosensing based on surface plasmon resonance (SPR) was first demonstrated by Kreschmann[1] and Otto in the late sixties by the method of attenuated total internal reflection. As a tool for monitoring biological interactions, SPR is non-invasive, real-time, and free of dye labeling. These features promise a broad range of applications in pharmaceutical, food, and biotech industries and greatly reduce developmental cost and cycling period in screening bio-interactions.

## 2. Micro-SPR biosensing

Conventional SPR requires precision angular control, often down to 0.0001 degrees. Such requirement inevitably demands stringent control of ambient temperature to fluctuation of less than 0.1 degree, posing a significant engineering challenge. In this presentation we are demonstrating the use of a unique type of SPR sensor for high spatially resolved detection. This special SPR sensor film is formed by coating a layer of gold nanoparticles. It does not require critical control of incident angle nor ambient temperature. It exhibits strong optical absorption due to the localized SPR (LSPR) effect. Together with its ability to acquire high quality absorption spectrum, the film has demonstrated its compatibility with high NA optics for micro-SPR sensing. The reaction of streptavidin and anti-streptavidin is used to test the viability of this film in monitoring bio-interactions through SPR effect. The kinetic data obtained show that micro-SPR sensing can be achieved at spatial resolution as high as 25 μm. [2]

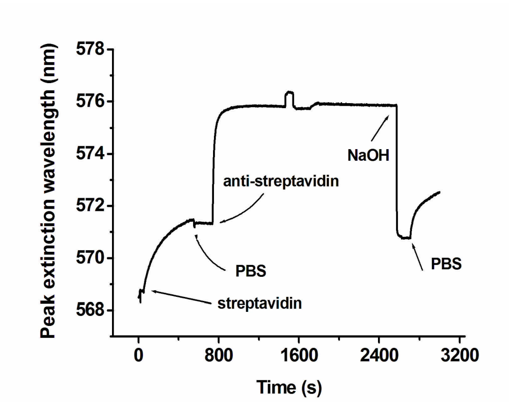


Figure 1: Kinetic measurements on the binding of streptavidin and biotinylated anti-streptavidin. The binding and de-binding is reflected in the shift of peak extinction wavelength.

## References

[1] E. Kretschman and H. Raether, “Radiative decay of non-radiative surface plasmons excited by light”, *Z. Naturforsch.* **23A**, 2135-2136 (1968).
[2] M.G. Somekh, “Optical Imaging and Microscopy”, Chapter 12. (Springer-Verlag, Berlin, 2003).