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# HIGH-PERFORMANCE BIOSENSING ON RANDOM ARRAYS OF GOLD NANOPARTICLES

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## 1 INTRODUCTION

We report on a plasmonic biosensor based on Fano resonance that is excited on an array of randomly distributed gold nanoparticles (AuNPs) on a glass substrate. Performance of the biosensor is investigated in a model experiment in which low concentrations of short oligonucleotides are detected.

## 2 EXPERIMENTAL SETUP

The sensing structure consisting of a random array of gold nanodisks on a glass slide was produced by electron beam lithography. The structure was illuminated in the attenuated total reflection geometry, and a 4-channel flow-cell was attached to the structure. Reflection spectra exhibit pronounced Fano-shaped dips resulting from the interference of interface reflection and localized surface plasmons supported by AuNPs. The spectral position of the resonance dip is highly dependent on the refractive index at the proximity of the AuNPs.

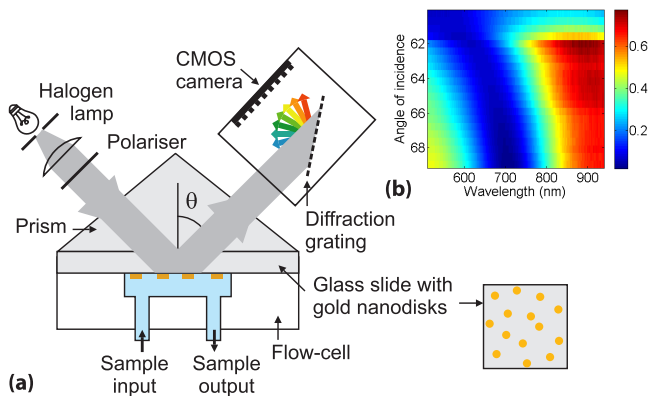


Figure. (a) Optical setup. (b) Reflection spectrum of the Fano resonance excited on the structure in TE polarization.

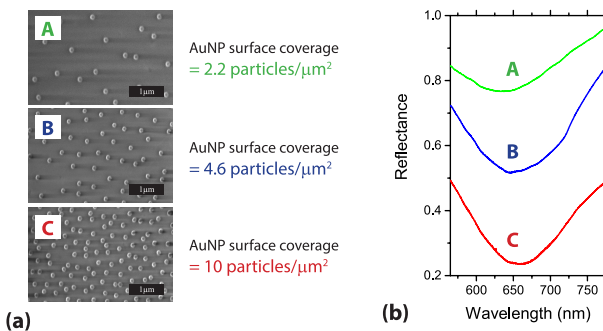


Figure. (a) SEM image and (b) reflection spectra of random arrays of gold nanodisks (height: 50 nm, diameter: 110nm, different surface coverage).

## 3 DNA DETECTION

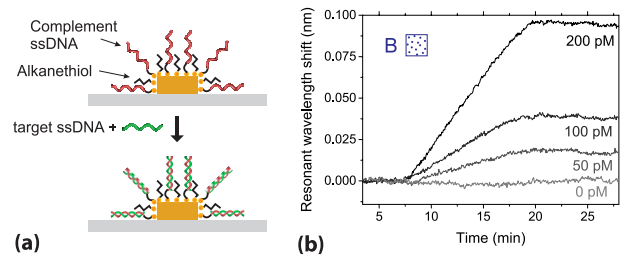


Figure. (a) Detection of short oligonucleotides. A mixture of oligonucleotides and alkanethiols were immobilized on the AuNP surface and sample containing target oligonucleotides was flowed through the flow cell. (b) Sensor response to different concentration (structure B).

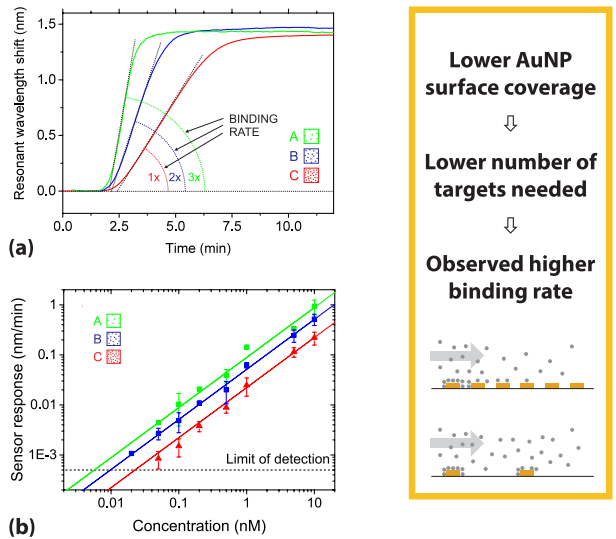


Figure. (a) Sensor response to 10nM concentration of target ssDNA. (b) Calibration curves for structures A, B, and C.

## 4 CONCLUSIONS

- A biosensor based on Fano resonance on an array of AuNPs was developed.
- Increased binding rate for surfaces with lower AuNP surface coverage was observed.
- Detection of short oligonucleotides was carried out.

**LIMIT OF DETECTION ~ 10pM**

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