Transmission Localized Surface Plasmon Resonance (T-LSPR) Spectroscopy for Immunosensing Applications

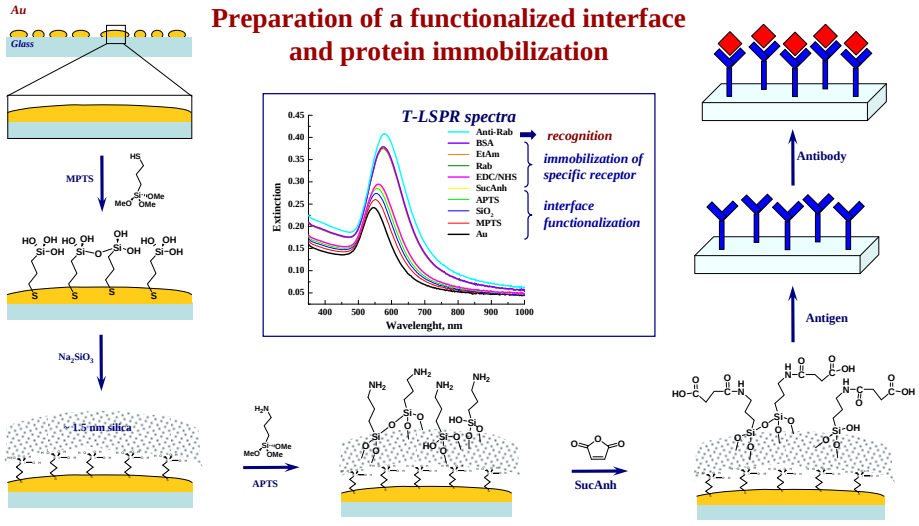
Tatyana Bendikov[1], Aharon Rabinkov[2], Tanya Karakouz[1], Alexander Vaskevich[1], and Israel Rubinstein[1]

[1]Department of Materials & Interfaces and [2]Biological Services Department, Weizmann Institute of Science, Rehovot 76100, Israel

Discontinuous, island-type gold films (typically <10 nm nominal thickness) evaporated on transparent substrates show a localized surface plasmon (SP) extinction in the visible-to-NIR range, conveniently measured by transmission spectroscopy. The SP extinction band is sensitive to changes in the refractive index of the contacting medium, thus enabling to monitor the binding of molecular layers to the Au island film with submonolayer sensitivity. The method, termed transmission localized surface plasmon resonance (T-LSPR) spectroscopy, provides an effective scheme for label-free biological sensing using basic spectrophotometric equipment.

In the present work the applicability of T-LSPR spectroscopy to monitoring specific antibody-antigen interactions is demonstrated. Protein-derivatized Au island films were used as a biological recognition surface for selective sensing of antibody binding, distinguishing specific and nonspecific interactions. Specific recognition of antibodies was demonstrated using an array of four T-LSPR transducers. Further improvement of the system will allow application of the technique to fast, simultaneous determination of a number of proteins using detector arrays.

Preparation of a functionalized interface and protein immobilization



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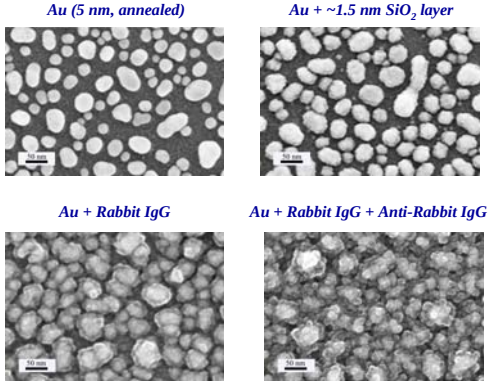
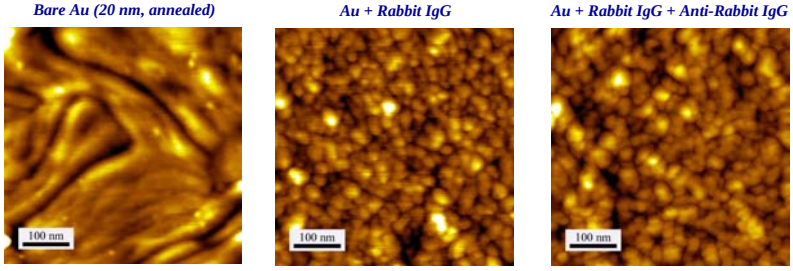
HRSEM



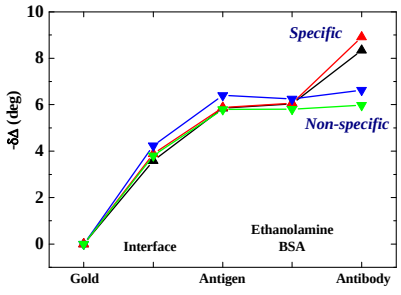
Samples coated with 3 nm Cr.

AFM



Ellipsometry Results

Substrates: 20 nm Au on silanized glass, annealed



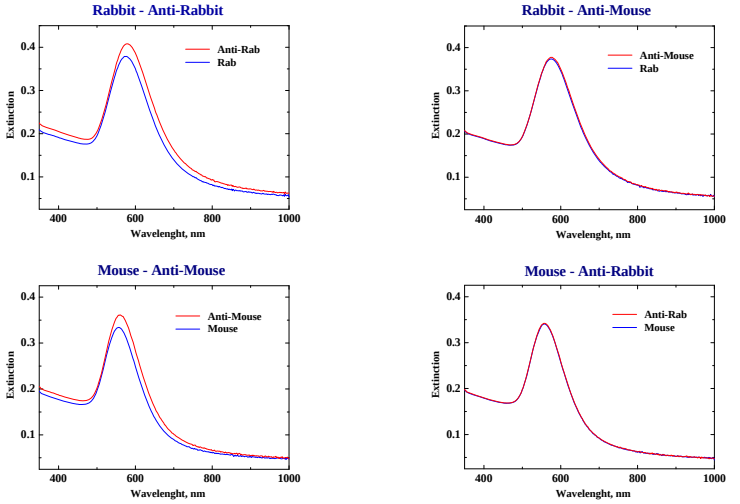
Antibody – Antigen interactions

Antigen: Rabbit Immunoglobulin G (IgG), Mouse Immunoglobulin G (IgG)

Antibody: Anti-Rabbit Immunoglobulin G (IgG), Anti-Mouse Immunoglobulin G (IgG)

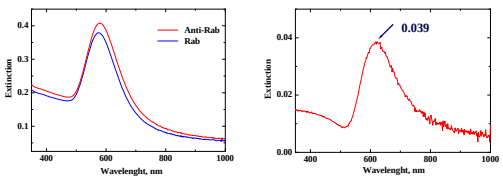
Antigen – Specific antibody

Antigen – Nonspecific antibody

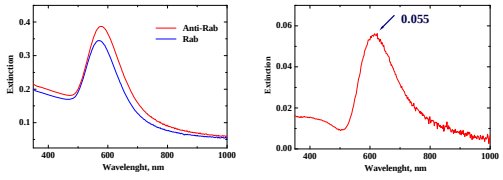


"3S": Simplicity, Sensitivity, Stability

Absolute spectra — Silica-modified Au islands: stable — *Difference spectra*



Mercaptosilane-modified Au islands



Bare Au islands: simple, sensitive