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Project :	Nanoelectronic biosensors for agro-food, environmental, medical monitoring and diagnostics applications.
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Introduction

Our health is continuously challenged by infectious diseases, food related toxins, and environmental pollution. The toxin in principle can be organic molecules, proteins, viruses, and bacteria. Protecting ourselves against such threats could be achieved by continuously monitoring their occurrence in strategic positions. In this project several applications are worked out as demonstration models of the potential of nanowire sensor technology.[1,2] Specifically we will work on the detection of small organic molecules like mycotoxins from food, and diagnostic proteins from tuberculosis bacteria and Mexican flu viruses. The project at this stage focuses on the measurement of the analytes in relatively clean aqueous solutions of low ionic strength. Reliable extraction protocols will be attended to once a functioning prototype has been developed.

Goal

The aim of this project is the development of a self assembled label-free multi-analyte bio-sensor system utilizing DNA-directed specific immobilization of capture molecules for fast, effective, economical, efficient and reliable detection of contaminants and diseases in process monitoring and diagnostic applications.

Progress achieved

In this project until now, we were able to identify and recombinantly produce one of the target proteins present in sputum of infected tuberculosis patient. Antibodies were also raised against this target protein and studies were done on their interaction with the recombinant target protein. Studies on binding kinetics of high affinity antibodies to the target protein were done using surface plasmon resonance measurements.

Further Research

Currently we are focusing on studying the tertiary structure properties of the target protein and also busy determining the target protein epitopes which are responsible for interaction with the antibodies. Next, we will link single stranded oligonucleotides to the antibodies using SNAP tag. These DNA-protein intermediates are then used to achieve specific

binding of capture proteins on the surface of a nanowire coated with complementary single-stranded DNA by DNA-directed immobilization. Finally, surface characterization and initial measurements will be performed using the tuberculosis related receptor- analyte pairs. If successful the developed techniques will be extended to other receptor ligand pairs involving smaller and bigger ligands ranging from organic molecules to viruses and bacteria.

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References

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2. J. Hu, R.W. Odom, C. M. Lieber, Controlled growth and electrical properties of heterojunctions of carbon nanotubes and silicon nanowires, Acc. Chem. Res., 32(5), 435 (1999).