Nanobiosensors for Food, Health and Environmental Monitoring: Affordable Diagnostics

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The Melbourne Centre for Nanofabrication
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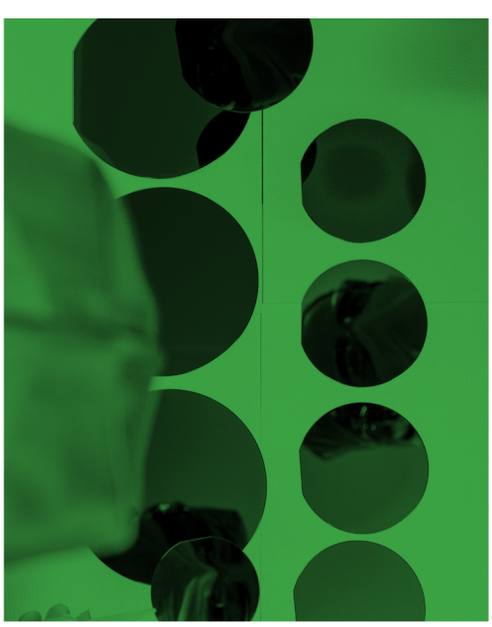

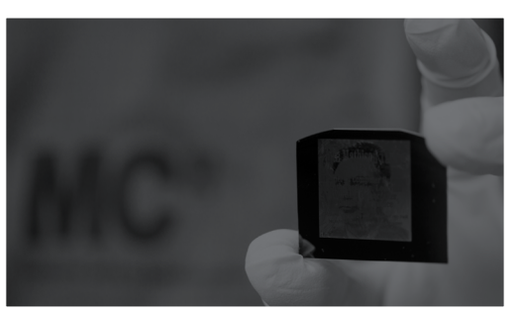

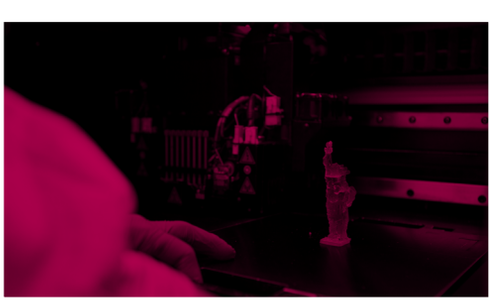

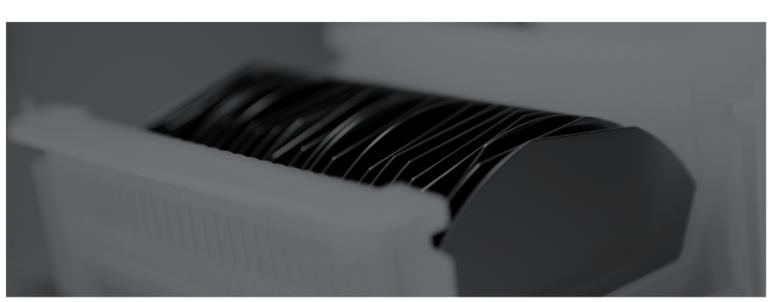

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Abstract:

Nanomaterials based biosensors hold a great potential to overcome the drawbacks of conventional analytical techniques. Nanomaterials such as metal nanoparticles, metal nanoclusters, metal oxide nanoparticles, metal and carbon quantum dots, graphene, carbon nanotubes and nanocomposites enable higher sensitivity by signal amplification and introduce several novel transduction principles such as FRET, BRET, CRET, enhanced chemiluminescence, fluorescence, Raman signals, electrochemical signals, enhanced catalytic activity, and super-paramagnetic properties to the biosensor and enhancing the signals to detect the analyte at an ultra-sensitive level.

A simple colorimetric biosensing technique based on the interaction of gold nanoparticles (AuNPs) with the specific aptamer was developed for detection of p53, a tumor suppressor protein, in our study. The detection limit of p53 protein by the colorimetric approach was detected at 0.1 ng/ml after successful optimization of the amount of aptamer, AuNPs, salts, and incubation time. the combination of colorimetric and CL-based aptasensor can be of great advantage in increasing the sensitivity of detection for any target analysts.

Some experimental examples will be discussed.

Luminescent quantum dots (QDs) possess unique photophysical properties, which are advantageous in development of new generation robust fluorescent probes based on Foster Resonance Energy Transfer (FRET) phenomena. Bioconjugation of these QDs with biomolecules create hybrid materials having unique photophysical properties along with biological activity. Our studies on QDs was aimed at characterizing QD bioconjugates in terms of optical behaviour and their applications for sensitive analysis of several analysts will be discussed. The experimental result suggests that these bioconjugates can be considered nanoparticle (NP) superstructures for the development of a new generation of robust nanoprobes.

Few examples of pesticides, toxins, vitamin b12, and formaldehyde, cancer causing toxins in food, bisphenols, and cancer biomarkers detection using nanobiosensors will be discussed during presentation.

Notes