

# 5<sup>th</sup> International Conference on **Nanotek & Expo**

**November 16-18, 2015 San Antonio, USA**

## **Nanotechnology-enhanced biosensors for pathogen detection**

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Nanotechnology has tremendous potential to enhance the performance of biosensors. The chemical, electronic, and optical properties of nano-materials generally depend on both their dimensions and their morphology. A major advantage of using nano-materials in bio-sensing is the number of bio-receptor molecules immobilized on the detector surface can be as low as a single molecule. As a result the number of analytes molecules required to generate a measurable signal could be just a few, providing very low limits of detection. As a sensitive, non-destructive, and label-free detection method, electrochemical impedance spectroscopy (EIS) has recently received considerable attention for the characterization of electrical properties in biological interfaces. We self-assembled gold nano-particles on gold electrodes to yield multi-layered molecular structures for sensitive pathogen detection and in situ regeneration of the sensor electrode. The use of molecular self-assembly and gold nano-particles plus EIS detection rendered a detection limit of 30 virus particles/ml for adenovirus 5 and 100 cells/ml for E-coli 0157:H7. The gold nano-particle sensor surface could be self-assembled and regenerated on the electrode at least 30 times without losing analytical performance. We also fabricated metal oxide nano porous-film electrodes, using glancing angle deposition (GLAD) technique, for highly sensitive detection of pathogens. GLAD utilizes oblique angle physical vapor deposition combined with precise substrate rotation to engineer nano-columns. The combination of nanotechnology and EIS is an attractive and powerful concept for future chemical and biological sensors research and integration in to lab-on-a-chip devices for field deployable sensors.

### **Biography**

William Edward Lee is a scientist at Defense R&D Canada - Suffield Research Centre. His research areas include bio-analysis, analytical chemistry micro-fluidics and biosensors. He is a graduate of McGill University (PhD) in Biophysical Chemistry and Molecular Spectroscopy.

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