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Selective sleuthing of *fluorescent Pseudomonas* through ion trafficking across gold-polycarbonate composite nanoporous membrane

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The use of nanoporous membrane in fabrication of biosensorsof high sensitive and specificity for the detection of various analyte is currently an issue of great importance, and its success is often dictated by the size and nature of pore as well as the detection element (the specific ligand) along with choice of target analyte. Here we introduce a polycarbonate trek etched (PCTE) nanoporous membrane having a 5nm gold sputtered porous layer to be used as a selective biorecognition element in aimpedimetricnanoimmunosensor for the label-free detectionof *fluorescent Pseudomonas*in real soil samples. A simple and rapid method to modify a nanoporous gold surface of membrane through functionalization bythe attachment of thiol group is followed by antigen-antibody complex. Thiolation and antibody attachment has effectively reduced the non-specific bindingof biomolecules and other cells, and permitted successful immobilization of antibodies. The *fluorescent Pseudomonas*, one of the most used soil-borne plant growth promontory Rhizobacteria, was tested as a model bacteria in this study.

The nanoporous membrane was characterized by FTIR, SEM andEDX/EDS; giving peaks of gold, thiol group, and amide bond at 2900 cm^{-1}, 3400 cm^{-1}, 1635 cm^{-1}respectively; while micrograph provide surface morphology and elemental analysis of this biorecognition element. Thermo gravimetric Analyzer (TGA) analysis provide information about membrane stability after the surface modification.The well characterized membrane was used in a specially designed cell for its use in development of nanobiosensor for the detection of *fluorescent* ***Pseudomonas*****(KNP2)** through electrochemical measurement.The ionic impedance of electrolytes through nanopores, due to antibody–bacteriainteractions, was monitored by impedance spectra and analyzed by normalized impedance change(NIC). The detection limit of *fluorescent* ***Pseudomonas*****(KNP2) was** found to be as low as 10 cfu/ml. In addition, the proposednanoimmunosensor was successfully used for the detection of *fluorescent* ***Pseudomonas*****(KNP2)** in real soil samples with thedetection limit as low as 88 cfu/ml with 90% probability. The cross reactivity of the nanoimmunosensor was alsodemonstrated using structurally related non-targeted bacterial strains of other soil borne bacteria. This study shows that a HA-functionalized nanoporous membrane-basedimpedimetric sensor is capable of detecting *fluorescent* ***Pseudomonas*****(KNP2)** in soil sample without any pretreatment.

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