Lead Inventor: Stanislaus Wong, Ph.D., Associate Professor, Department of Chemistry

Title: Functionalized Carbon Nanotubes for Protein Detection

Background: The functionalization of single walled nanotubes (SWNTs) with biological systems has gained much interest in recent years. Such a bio-nano integrated system combines the conducting and semi-conducting properties of carbon nanotubes with the recognition and catalytic properties of biomaterials for the development of novel biosensor systems. The specific recognition of target molecules is the essential feature for biological sensing.

SWNTs can be functionalized with biomolecules both inside their internal cavities as well as on their external surfaces. Enzymes, proteins, peptides, antigen-antibody complexes, viruses, and oligonucleotides can readily bind to the SWNT surface either non-specifically by non-covalent interactions or through covalent sidewall functionalization of SWNTs.

Technology Description: Dr. Wong and his colleagues at Brookhaven National Laboratory and University of Pennsylvania have explored the biocompatibility and feasibility of a ligand-receptor protein system bound to oxidized SWNTs. We demonstrated a simple, fast-response, highly sensitive, real-time biosensor composed of a ligand-receptor protein complex covalently attached by a diimide linker to oxidized SWNTs via a mild, ambient, straightforward, and economical protocol. That is, we not only retained the intrinsic biological activity and specificity of the attached complex but also conserved the highly favorable electronic properties of SWNTs in these bio-functionalized single-tube devices.

Applications: Biosensor system for the detection of enzymes, proteins, peptides, antigen-antibody complexes, viruses and oligonucleotides.

Advantages: The present work provides proof-of-concept for developing a simple, efficient, sensitive, fast-response, and real-time miniaturized nanotube FET biosensor for detecting the Ad 12 Knob virus using CAR-Knob specificity. Moreover, this methodology can be extended to uncover the presence of serotype12 and all other possible CAR-binding adenoviruses (about 30 serotypes, including Ad2 and Ad5), as well as subgroup B coxsackie viruses. This is the first evidence of straightforward, ambient covalent immobilization of a viral ligand-receptor protein system onto individual SWNTs and SWNT bundles, and of our subsequent confirmation of the bound proteins’ retention of biological activity and specificity, as revealed by systematic electrical measurements.


For additional information please contact: Ms. Donna Tumminello
Assistant Director
dtumminello@notes.cc.sunysb.edu
Phone: 631-632-4163