A Synthetic Nanotube Antibody for Molecular Recognition
Technology #14090

Applications

- *In vivo* or *in vitro* sensors for biological detection
- Targeted carbon nanotubes for therapeutic applications

Problem Addressed

This method provides a solution to developing "synthetic antibodies" from synthetic polymers adhered to single walled carbon nanotube surfaces.

Technology

Molecular recognition and signal transduction are two central aspects and challenges to the design of sensor platforms. Natural antibodies are often used as vital components of sensors. However, antibodies are expensive, fragile and easily lose biological activity upon external treatment and exhibit batch-dependent variation, limiting their use. Moreover, certain biological molecules of interest don’t have a naturally existing antibody, including toxins, drugs and explosives. This has driven the search for methods to synthesize artificial antibodies from polymeric materials. SWNT photoluminescence (PL) has been used in sensor platforms for detection of DNA, divalent metal cations, genotoxins, reactive oxygen species and pH, among others. Yet, identifying methods to modulate SWNT PL in response to a specific analyte binding event remains a main challenge in sensor fabrication. Here, it is shown that a random polymer, with little or no affinity for an analyte, will adsorb in specific configurations to SWNTs such that the analyte will both bind to the polymer-SWNT complex and induce a measurable PL signal change. The polymer-nanotube complex can in effect act as a novel nanotube "sensor antibody".

Advantages

- For target protein or protein therapeutic detection there is no need to tag or label the target to enable detection as the SWNT complex binds directly
- Works for small molecules and molecules with no known binding partner
- Allows for continuous detection of the target analyte
- Multivalent interactions between the polymer and the SWNT are possible ensuring higher efficacy
- "Synthetic antibodies" may reduce development time compared to antibodies
- Can also be used to deliver therapeutic molecules, ensuring directed drug release
- Elucidation of *in vivo* reaction pathway because fluorescence is tissue transparent

Categories For This Invention:

Life Sciences
Diagnostics
Therapeutics

Intellectual Property:
Polymer-nanostructure composition for selective molecular recognition
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Publications:
Understanding Selective Molecular Recognition in Integrated Carbon Nanotube–Polymer Sensors
Soft Matter
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External Links:
Strano Group
http://srg.mit.edu/

Image Gallery:

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