SARS-COV-2 DETECTION BY CARBON NANOTUBE-BASED NANOSENSORS

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PATENT STATUS

Patent Pending

BRIEF DESCRIPTION

The inventors have developed a real-time optical nanosensor for detection of active SARS-CoV-2 infection, which includes a modular synthesis scheme that is amenable to detection of other viral infections. The nanosensor is constructed from near-infrared fluorescent single-walled carbon nanotube (SWCNT) substrates functionalized with biomolecules that have high binding affinity to viral proteins and viral genomic material.

Virus binding to the nanosensor instantaneously changes the SWCNT fluorescence. This fluorescent readout serves as the optical signal that coronavirus is present in the clinical sample. The near-infrared fluorescence signal is detectable in biological samples, offering the prospect of detecting active SARS-CoV-2 in unprocessed, crude biofluid samples from individuals with readouts provided in tens of minutes. These SWCNT-based nanosensors are adaptable to point-of-care diagnostic devices to enable accessible, rapid testing of active SARS-CoV-2 infection. Furthermore, the reagents and detection devices would be sourced from different supply chains than existing tests and provide orthogonal advantages to such tests.

SUGGESTED USES

This real-time optical nanosensor technology can be used in:

» rapid point-of-care diagnostic tests, to detect active viral infections
» wearable devices, to continuously monitor an individual’s viral exposure
» environmental sensors, to track aerosolized viruses
» water sensors, to track viral levels in wastewater or in clean drinking supplies

ADVANTAGES

This technology serves coronavirus pandemic requirements for broad-scale testing to swiftly treat individuals, to track infection, and to accurately quantify and model the pandemic spread. In contrast, current diagnostic tests face obstacles in supply (relying on few, difficult-to-access instruments and reagents), throughput (long tests leading to long sample turnaround times), and accuracy (particularly with fast antigen tests).

In comparison to currently employed testing modes, this platform:

offers functionality in complex biofluids, such as unprocessed clinical samples relies on accessible reagents not affected by supply chain obstacles is multi-use, due to a reversible signal can be deployed by non-experts makes point-of-care diagnosis possible

RELATED MATERIALS
ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Gene Delivery Into Mature Plants Using Carbon Nanotubes
- High-yielding Extraction of Single-Stranded Nucleic Acids with Carbon Nanotubes
- Method For Imaging Neurotransmitters In Vitro and In Vivo Using Functionalized Carbon Nanotubes