AI-POWERED DIAGNOSTICS

A Reagent-free Portable Biosensor For Spectral Detection Of Biologically Active Molecules

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There is a need to develop novel high-throughput and ultra-sensitive detection assays to sense small molecule exposures that may cause adverse effects on human and ecological health. Direct detection in bio-fluids and environmental media (drinking water, wastewater, surface areas, air, etc) has gained interest with the development of sensitive detection platforms but are often limited to one-threat-one-test with high operating cost, complex sample preprocessing, low sensitivity (leading to false negatives) and significant cross-reactivity (leading to false positives). On the other hand, agnostic multi-wavelength spectroscopy provides an alternative to rapidly identify small molecules at micromolar concentrations in complex matrices when combined with back-end machine learning. We present the Pattern Computer®, Inc. ProSpectral™, a novel, portable (~8 lbs) and push-button hyperspectral platform. While traditional spectrometers are typically bulky and expensive, the ProSpectral™ incorporates miniaturized spectrometers with ultra-high spectral resolution (2 nm full-width, half-max), allowing for the potential of a point-of-care diagnostic platform that is relatively inexpensive. The ProSpectral™ features two mini-spectrometers covering both the visible and near-infrared portions of the electromagnetic spectrum, making chemical bond rotations and bond lengths detectable at 1° and 0.01 Å, respectively. The rapid generation of spectra allows for the quick conversion of data into policy change in the face of emerging threats. This engineering innovation has enabled rapid reagent-free biosensing for the first time. Here we present our results that demonstrate the utility of this platform for high-confidence detection of SARS-CoV-2 infection, innate immune markers and small molecules in complex matrices.