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(UG*) (POS-46) Development of a Surface Enhanced Raman Spectroscopy Sensor for the Detection of Trace Concentrations of Small Molecules

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Detection of trace concentration of small molecules in various medias is highly necessary for many applications and uses, creating a need for the development of sensitive and reliable detection methods. Surface-enhanced Raman spectroscopy (SERS) offers a promising solution due to its ability to provide fingerprint-like spectra of molecules, enabling precise identification even at trace concentrations. In this study, we present the fabrication and testing of a SERS sensor tailored for the detection of small molecules such as benzoyl peroxide, gibberellic acid and salicylic acid.

Thin-film gold nanostructures were fabricated using the pulsed laser deposition technique. The thin film-like gold nanoparticle substrates, crafted through a top-down approach, exhibit elevated stability, sensitivity, enhanced accuracy, and heightened precision in measurement compared to colloidal solutions. Their controlled composition, thickness, and other properties facilitate uniform interaction between analyte and substrate, ensuring dependable and consistent performance across experiments.

The sensor's performance was evaluated by testing different concentrations of small molecules. The SERS sensor exhibited high sensitivity and specificity, allowing for the detection of small molecules at trace levels. Furthermore, the efficacy of the SERS sensor was validated through real small molecule testing. Small molecule matrices were analyzed, and the sensor successfully detected and identified these molecules present in these complex matrices, demonstrating its practical utility in various applications.

Overall, our results highlight the potential of SERS-based sensors as powerful tools for the rapid and reliable detection of small molecules, ensuring the integrity of certain medias.

Keyword-1

SERS Sensor

Keyword-2

Small molecules

Keyword-3

Thin-film gold nanostructures

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