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Contribution ID: **4000** Type: **Poster Competition (Graduate Student) / Compétition affiches (Étudiant(e) 2e ou 3e cycle)**

(G*) (POS-14) SERS-enabled sensing of hemoglobin and its variants on ligand functionalized gold nano-film

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Our goal is to develop a nano-biosensor using surface-enhanced Raman spectroscopy (SERS) to analyze and measure hemoglobin (Hb) levels, even at low concentrations, with good accuracy and reproducibility. This will facilitate fast and real-time differentiation of Hb disorders, such as sickle cell anemia, without using any labels or fluorophores.
To enhance the sensitivity of the Raman spectrum, noble metal nanoparticles with strong localized surface plasmon resonances are used to amplify the output signals by multiple orders of magnitude, resulting in a significantly stronger Raman spectrum. To achieve this, we utilize advanced gold nanostructured surfaces produced through the pulsed laser ablation technique. This thin film-like gold nanoparticle substrates manufactured by a top-down approach boasts high stability, sensitivity, improved accuracy, and greater precision in measurement than colloidal solution. The uniform interaction between analyte and substrate due to its controlled composition, thickness, and properties enables reliable and reproducible performance. These surfaces are coated with a novel heteroaromatic ligand L, the alpha-lipoic acid derivative of 2-(2-pyridine)imidazo[4,5,f]-1,10-phenanthroline, which selectively senses Hb. The phenanthroline unit of L can form strong coordination bonds with the iron center of the Hb's heme unit, allowing for precise detection. Our SERS-based assay platform uses the dipping time vs Hb concentration dynamic study model to measure Hb levels. The porphyrin methine bridge-related SERS band at 1550 cm-1 is used to quantify Hb.
The stability of the sensor is monitored for a week by the SERS spectra which remained unchanged. Additionally, the sensor can differentiate between oxy and deoxy forms of Hb and distinguish between normal and abnormal Hb variants by analyzing the variation in SERS characteristic bands in the 'fingerprint region' . Overall, this innovative approach holds great promise for the development of a lateral flow assay, enabling diagnosis of Hb disorders.

Keywords: Hemoglobin; Ligand functionalization; SERS; Gold nanostructured substrates; Pulsed laser deposition.

Keyword-1

Hemoglobin

Keyword-2

Ligand functionalized Au NPs

Keyword-3

Surface enhanced Raman Spectra

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