Development of a Wearable, Surface-Enhanced Raman Optical Sensor for Rapid, Non-Invasive Detection of Sweat Metabolites

Abstract

Sweat-based diagnostics have the potential to enable rapid, non-invasive disease detection. However, current implementations lack the speed, sensitivity, and portability required for clinical use. In this report, we introduce a wearable, silver-based sensor that employs surface-enhanced Raman spectroscopy (SERS) to detect dissolved biomolecules in sweat. Through *in vitro* testing, we optimized the fabrication of our sensor and demonstrated that it could detect the presence of two critical metabolites in human sweat – namely, uric acid and L-ascorbic acid – at near-physiological (<1mM) concentrations. Moreover, Raman peaks aligned with expected vibrational modes and were amplified in proportion to the silver content of the substrate, suggesting robust surface amplification. Collectively, these data will inform more sensitive and reliable iterations of our sensor, making it more viable as a clinical diagnostic.