Fabrication of High Quality Electrochemical SERS (EC-SERS) Substrates using Physical Vapour Deposition

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Screen-printed electrodes (SPEs) are an efficient and inexpensive substrate for electrochemical surface-enhanced Raman spectroscopy (EC-SERS) studies. Traditionally, the working electrode of the SPE is modified with either a colloidal paste of metal nanoparticles or an electrodeposited metallic film. These methods can be time-consuming and often produce non-uniform nanostructured films. Physical vapour deposition (PVD) is presented in this work as an efficient and effective alternative method for the production of SERS-active SPEs. SPEs coated with silver thin films via PVD show consistent and strong EC-SERS enhancement for the detection of two probe molecules, 4-aminothiophenol (p-ATP) and 5-(pyridine-4-yl)-1,3,4-oxadiazole-2-thiol (PYOT). The EC-SERS signal intensity for p-ATP and PYOT had coefficients of variation of 8.2% and 5.5%, respectively. More generally, these substrates show promise for reliable enhancement of molecules spanning diverse analytical applications.

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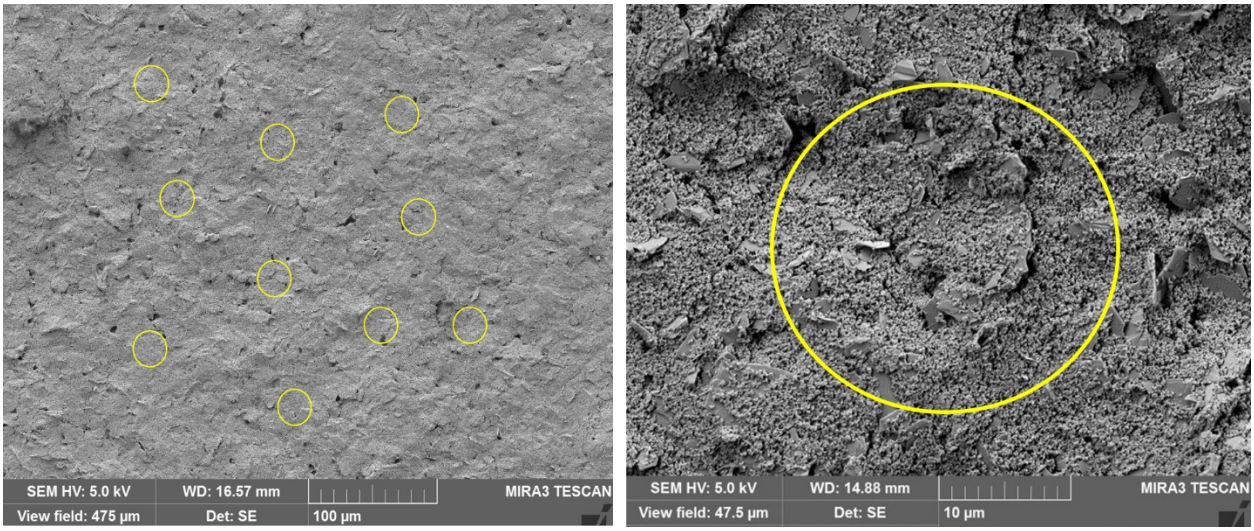

Figure S1. Representation of the ten selected spots analyzed on the screen printed electrode with the PVD deposited silver layer. Each spot represents the area of laser irradiation at focus where the diameter of the spot is 25 µm.

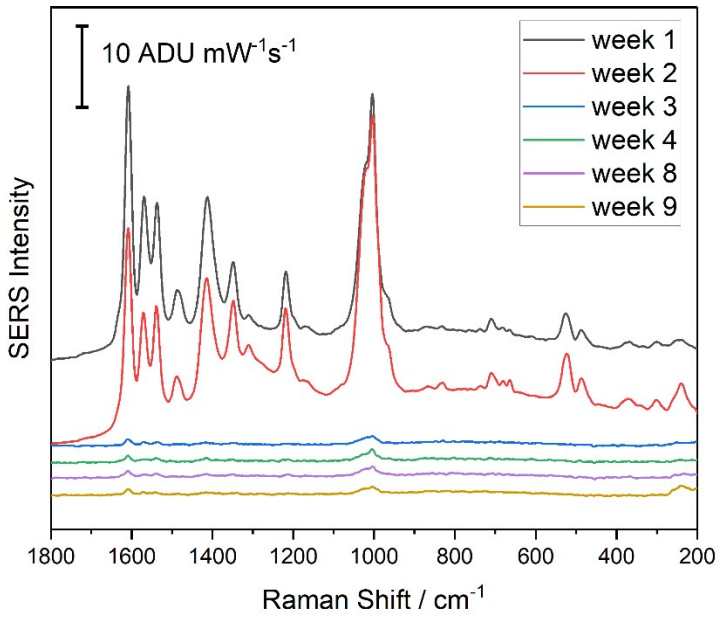

Figure S2. Stability of PVD-SPE substrate in which PYOT is drop-coated onto the surface of a SPE coated the designated number of weeks prior to EC-SERS studies; Laser excitation: 785 nm, Laser power: 29.3 mW s^{-1}, Acquisition time: 30 seconds. All spectra were collected in the absence of applied potential.