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Surface Enhanced Raman Scattering study of MXene based glass substrates

Surface Enhanced Raman Scattering (SERS) has become a powerful technique in the detection and identification of biologically important molecules. MXenes are a family of two-dimensional transition metal carbides and nitrides that exhibit plasmonic properties, making them promising candidates for the preparation of SERS active substrates. It has been shown previously, that MXene based SERS substrates are able to detect low concentration of organic dye molecules such as rhodamine B, rhodamine 6G, methylene blue, and crystal violet [1]–[3]. Nowadays, the applicability of detecting these molecules using MXene compounds has been extensively studied. However, there is still need to broaden their possible application to the detection of small concentrations of bio molecules. Here, we demonstrate the SERS properties of MXenes based glass substrates using rhodamine B, as a model molecule and study the possibility of using SERS enhancement for human insulin detection. We found that spray coated MXene continuous films on glass substrates exhibited SERS sensitivity. In particular, rhodamine B was detected in the range of 10^{-3} to 10^{-6} M. However, the substrates did not show SERS activity towards human insulin. The detection limit of insulin on the spray coated MXene on glass did not differ from bare glass substrate, being equal to 0.25 mM. Our results show that while MXenes are a very promising new SERS platform, further work is needed to utilize them in detecting small bio molecules at biologically relevant concentrations.

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