Žadinimo bangos ilgiui pritaikomi SERS padėklai biojutiklių taikymams

Wavelength-tailored SERS active substrates for biosensing applications

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Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the strain of coronavirus that causes COVID-19, has shocked the world with its rapid spread and severe consequences and made the scientific world develop reliable infection tests. Nowadays, there are two widely used methods: molecular diagnostic and serologic tests. The first one is considered to be very sensitive but time-consuming, whereas the second is fast and simple but cannot be applied for early COVID-19 diagnosis. Thus, there is a need for developing methods that provide fast and reliable detection of viruses.

Surface-enhanced Raman scattering (SERS) is a powerful analytical technique used in chemistry, pharmacology, and biomedicine for studying biological systems, *e.g.*, proteins, tissues, bacteria, or viruses. This method deserves consideration for its ability to target molecules, such as viral particles or biomarkers associated with the SARS-Cov-2 detection. Moreover, the analysis can be performed in a label-free way.

A periodic array of noble nanoparticles with tunable optical properties finds application across various fields, ranging from photocatalytic processes to laser technology [1–3]. Recently, the study focusing on this structure's application in SERS has been reported [4,5] and interest is constantly increasing. Lately, our research group demonstrated that the tailored-to-target wavelength optical response of silver nanoparticle array produces an increase in SERS sensitivity demonstrating the enhancement factor (EF) up to 10^9 [6].

Within the present study, we have fabricated SERS-active substrates consisting of 2D nanostructures of periodic arrays of Au nanoparticles implemented into a polymer matrix using a capillary-assisted particle deposition technique and surface-functionalized with SARS-CoV-2 antibodies. The arrays are shown to be applicable for the efficient and specific detection of micro-molar concentrations of antibodies through the observation of their SERS signals (Fig. 1).

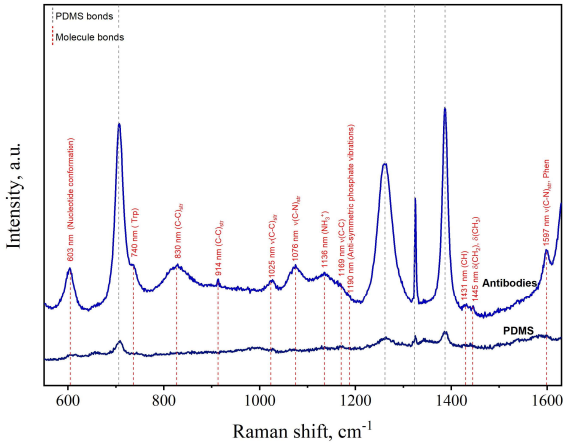

Fig. 1. SERS spectra of PDMS template with Au nanoparticles and detection of SARS-CoV-2 antibodies

Keywords: gold nanoparticles, SERS-active substrates, biosensing, SARS-CoV-2.

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