Towards multimodal readout application of plasmonic arrays verified by DNA detection schemes

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Fluorescence spectroscopy and microscopy are important techniques in life science and medicine. They are used for tracking fluorescent biological molecules or dye labels (e.g. in DNA detection) by means of their specific light emission. Additionally, Raman spectroscopy provides the detection of highly specific molecular fingerprint information of molecules due to the indirect excitation of vibrational modes via an inelastic scattering process. However, the Raman cross section is very low, which hampers the extent towards trace analytics and fast detection times. Due to the interaction of molecules with a nanostructured metallic surface, the inherent weak Raman signals are significant enhanced by several orders of magnitude. This technique is called surface-enhanced Raman spectroscopy (SERS) and combines a unique fingerprint specificity and potential trace level sensitivity, which is an ongoing topic in (bio)analytics [1].
To test the performance and capability of plasmonic arrays in bioanalytics, we have applied regular patterned nanostructured metallic surfaces [2-4] towards a DNA detection scheme using a combination of the fluorescence and SERS read-out technique [5]. Here, fluorescence microscopy allows a fast detection of any positive or negative binding event. Additionally, detailed molecular fingerprint information is detected via SERS spectroscopy, which allows also the parallel detection of reporter molecules with nearly the same light emission properties. This work might be a contribution to a more flexible usage of different detection schemes using the same chip surface.

References

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