Avviso di seminario, mar 19/2/2019, ore 11.00, presso Aula 1, Area di Ricerca di Firenze CNR

SERS in microfluidics – monitoring of drugs and metabolites in body fluids

Dana Cialla-May, Karina Weber, Jürgen Popp

Leibniz Institute of Photonic Technology (IPHT), Albert-Einstein-Straße 9, 07745 Jena, Germany
Friedrich Schiller University Jena, Institute of Physical Chemistry and Abbe Center of Photonics, Helmholtzweg 4, 07743 Jena, Germany
InfectoGnostics Research Campus Jena, Centre for Applied Research, Philosophenweg 7, 07743 Jena, Germany

Powerful detection schemes in bioanalytics are associated with the requirements for molecular specificity, high sensitivity and fast detection times. Surface enhanced Raman spectroscopy (SERS) is known to meet those requirements and the strong capability of this method in bioanalytical detection schemes is due to the enhancement of the molecular specific Raman fingerprint by several orders of magnitude employing plasmonic active nanostructures. [1] Within this presentation, the combination of SERS-based detection schemes with microfluidic systems will be focused which allows for reproducible measurement conditions and high throughput analysis. As an example, the broad spectrum antibiotic levofloxacin is characterized mimicking a complex biological composition employing simulated urine. [2] First, different parameters such as matrix complexity, aggregation time and matrix dilution on the overall SERS signal is investigated. Within the second part of this study, levofloxacin is spiked in human urine and the quantitative analysis is achieved down to a root means square error of prediction (RMSEP) between 0.058 and 0.16 mM for the different investigated urine samples. Finally, the microfluidic SERS approach is discussed for the detection of pyocyanin, a metabolite specific for infections with *Pseudomonas aeruginosa*. [3] Here, the analyte molecule is detected down to 10 µM in human saliva. The achieved results demonstrate, that the matrix molecules do not prevent the interaction of the analyte with the SERS-active surface.

[1] Cialla-May et al., Chem. Soc. Rev., 2017, 46, 3945-3961.
[2] Hidi et al., J. Phys. Chem. C, 2016, 120, 20613-20623.
[3] Zukovskaja et al., Sensors, 2017, 17(8), 1704.

Acknowledgement: Funding of the research projects “JBCI 2.0” (03IPT513Y) within the framework “InnoProfile Transfer – Unternehmen Region“, “EXASENS” (13N13856) and “InfectoGnostics” (13GW0096F) by the Federal Ministry of Education and Research, Germany is gratefully acknowledged.

Dr. Dana Cialla-May is Group leader of JBCI group together with Dr. Karina Weber within the department of Prof. Dr. J. Popp – *Leibniz Institute of Photonic Technology* (IPHT) Jena, Germany. The focus of her research is on the molecular specific and very sensitive method of surface enhanced Raman spectroscopy (SERS). In addition to research into manufacturing strategies for high-performance SERS-active sensor surfaces, the research is focused on the application of the method for bioanalytical and medical questions. This includes the detection of antibiotics and metabolites in biological matrices such as urine, sputum or culture supernatants as well as environmental samples. To ensure SERS-based measurements in high throughput and under reproducible conditions, the SERS technology is used in combination with microfluidic functional elements and cartridge systems. She is author of >80 publications and 3 patents, (2324 citations, h-index=22, 2 papers with > 300 citations)