Università degli Studi di Padova

Dipartimento di Scienze Chimiche

Giovedì 9 Gennaio 2020 alle ore 15.00
presso l'Aula M

il prof. Matteo Tommasini

Dipartimento di Chimica, Materiali e Ingegneria Chimica "G. Natta",
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terrà il seminario:

Recent developments in the use of SERS for Therapeutic Drug Monitoring

La presenza della S. V. sarà molto gradita

il Direttore del Dipartimento
prof. Michele Maggini

dr. Antonio Barbon

Abstract

Therapeutic Drug Monitoring (TDM) is a clinical practice to assess the drug concentration in a biological fluid, usually blood plasma. TDM is critically important for Narrow Therapeutic Index (NTI) drugs, including Anti-Epileptic Drugs (AEDs), where small differences separate therapeutic from toxic doses. Blood concentration of AEDs is measured with the time consuming and costly immunoassay tests, or High-Performance Liquid Chromatography-Mass Spectrometry (HPLC-MS).

Light scattering with ad hoc engineered plasmonic substrates made of noble metal (Au) nanoparticles (NPs) grown by pulsed laser ablation is a fast and comparatively inexpensive TDM approach for AEDs. Ablating in a transparent liquid a colloidal solution of Au NPs is obtained, while in a dense, inert, massive gas (Ar) NPs form in the expanding plasma plume and are deposited on an inert support (100-Si). Ambient gas pressure and laser pulse number in gas-phase synthesis and pulse duration and laser energy density in liquid-phase ablation affect the size, size distribution, shape and optical properties of the NPs and the NP arrays that self-assemble on the support making possible to adjust the wavelength of the Surface Plasmon Resonance (SPR) peak. Thus, Surface Enhanced Raman Scattering (SERS) on samples of different origin with various AEDs at concentrations of clinical interest become feasible.

We have tested thin nano roughened Au films produced by pulsed laser deposition for quantitative SERS sensing of the anti-epileptic drug Perampanel within the range of concentrations of therapeutic interest (3x10-7 M – 3x10-6 M). We propose a model to elucidate the dependence of the SERS intensity as a function of analyte concentration and contact time between the Au surface and the solution [1].

Reference

[1] C. Zanchi, L. Giuliani, A. Lucotti, M. Pistaffa, S. Trusso, F. Neri, M. Tommasini, P. M. Ossi, On the performance of laser-synthesized, SERS-based sensors for drug detection, submitted (2019).