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PROCEEDINGS

Betalactamic Antibiotics Monitoring by Raman/SERS Spectroscopy using Non-conventional Nanoparticles

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Various analytical techniques, including gas chromatography, electrochemical immunosensors have been documented to identify and characterize molecules with biological significance, like antibiotics, which is crucial in biomedicine. The surveillance of drug usage in intensive care units proves pivotal in combating of infectious ailments, notably antibiotic-resistant bacteria, a significant challenge in global healthcare [1]. However, many methods demand substantial reagents, utilize costly equipment, and frequently consume considerable time. There is a need to devise inexpensive, rapid, and sensitive detection methods. Optical-based approaches like Raman spectroscopy and Surface-Enhanced Raman Scattering (SERS) present promising avenues for such diagnostic technologies [2]. Furthermore, ample opportunity exists for research into alternative materials, such as post-transition metals, to be employed in this domain (beyond Ag and Au nanoparticles (NP)) [3]. Using laser-generated NP as substrate materials, we present results on SERS for the monitoring of beta-lactam drugs (class of antibiotics that have beta-lactam ring, which imparts bactericidal activity), which are commonly prescribed in critically ill patients, being this the most important class of antibiotics. Our Raman experiments were performed by mixing aqueous solutions of antibiotics with several elements' NP (Au, Co, Cu, V). Ampicillin, Ceftazidime, and Meropenem were tested for Raman/SERS. We demonstrate the possibility of antimicrobial fingerprint identification, interesting vibrational peak changes and intense enhancement of specific Raman peaks. All tested NP are potential candidates for developing Raman/SERS biotests for molecular monitoring and characterization of antimicrobial drugs.

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References:

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