SERS analysis of bacterial strains: Escherichia coli and Staphylococcus epidermidis

Abstract

134. SERS Analysis of Bacterial Strains: *Escherichia coli* and *Staphylococcus epidermidis*

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Bacteria are prokaryotic microorganism whose pathogenic activity can affect every aspect of daily life. In this context, a powerful tool for their detection is provided by the Surface Enhanced Raman Spectroscopy (SERS), that can reveal the cellular composition of different bacterial strains with high sensitivity and intrinsic specificity. In this study, mesoporous silicon-based SERS substrates decorated with silver nanoparticles were used to investigate the vibrational pattern of *S. epidermidis* and *E. coli*, representative Gram-positive and Gram-negative bacteria, to provide a reproducible method to discriminate between distinct bacterial strains. At first, each spectrum was completely characterized in order to evaluate the contribution of each vibrational mode. The SERS spectra showed species-related features, arising from the different composition of the cell wall as well as their distinctive biofilm matrix and metabolic pathways. Furthermore, a life cycle analysis was carried out monitoring the evolution of the main SERS bands over time, analyzing the bacteria population after 12, 24 and 48 h of culture The results pointed out an increase of the intensity of the bands after 24 h, while a successive decrease at 48 h was observed, in agreement with the bacterial growth profile.