ENGINEERED METALLIC NANOSTRUCTURES FOR THE DETECTION OF FOOD CONTAMINANTS BY SURFACE ENHANCED RAMAN SCATTERING

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In the recent years, Raman spectroscopy was attested as a good candidate for food analysis. It is a rapid, simple and non-destructive technique which provides highly selective detection due to the specific Raman fingerprint of molecules. The sensitivity of Raman technique can be increased of several orders of magnitude exploiting the Surface Enhanced Raman Scattering effect. In general, SERS is obtained when molecules are absorbed onto, or microscopically close to, a suitable plasmonically active surface, such as roughened nanostructured metal surface, or metal colloids. Nevertheless, standardized methods of production and application of SERS systems are still needed. A good compromise between sensitivity and reproducibility of analysis is necessary to provide metrological analytical methods in the detection of food contaminants. The scope of this work is to compare different nanostructured systems to provide a reproducible Surface Enhanced Raman Scattering effect. Several innovative approaches were tested using different probe molecules, such as melamine and cumarin, which were selected as representative test materials for a wide class of food contaminants. SERS active surfaces ranging from solid substrates, such as flexible metal coated silicon nanopillars, and liquid suspensions of metal colloids, such as spheroidal nanoparticles and nanostars, were fabricated and tested in order to compare their efficiency in the detection of the above cited contaminants. The reproducibility of both strategies is also evaluated to investigate their applicability in the development of quantitative or screening methodologies.