Development of nanoplatforms for sers based on silver nanostars

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High-performance, low-cost and reproducible SERS platforms are critical for the application of this ultra-sensitive technique in numerous fields, including the detection of biological and environmental analytes. In this this work, we developed a low cost, ultra-sensitive homogeneous substrate based on borosilicate glass covered with silver nanostars (AgNSs) for indirect detection and quantification by surface-enhanced Raman spectroscopy (SERS)[1]. Similar substrates were proven to have a good performance in SERS, providing enhancement factors up to 10^4.[2,3] Substrate fabrication was performed by centrifugation of a colloidal suspension of AgNSs into the glass substrate. Optimization of the experimental conditions was performed by varying parameters such as (i) concentration of AgNSs, (ii) morphology of AgNSs, (iii) solvent. Colloidal stability and hydrodynamic diameter of the AgNSs suspensions was investigated by dynamic light scattering (DLS), electrophoretic light-scattering (ELS) and nanoparticle tracking analysis (NTA) showing zeta potential -35.5 ± 1.1 mV and hydrodynamic diameters of 83.0 ± 2.1 nm. The surfaces were characterized by scanning electron microscopy (SEM), with the best ones showing a homogeneous particle distribution on the surface (figure 1B). Until the present moment, tests using crystal violet as SERS probe showed an enhancement factor of 8.9 x 10^6 for the best substrate based on AgNSs with tip-to-tip length of ≈270 nm.

REFERENCES

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FIGURES

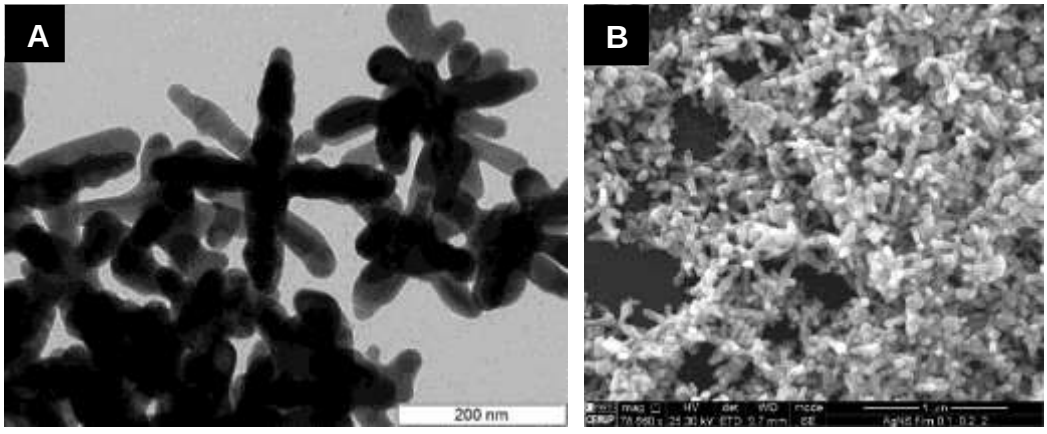

Figure 1: Transmission electron microscopy (TEM) micrograph of AgNSs (A) and scanning electron microscopy (SEM) micrograph of a SERS substrate (B).

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