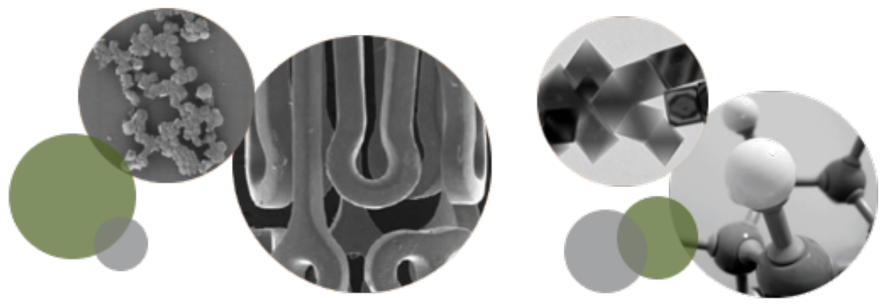
2020 NANOPORTUGAL CONFERENCE ONLINE

September 23-24, 2020



Nanoscience and Nanotechnology International Conference

Development of nanoplataforms for SERS based on silver nanostars

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Background and Objectives

- This work is based on **Surface Enhanced Raman Spectroscopy (SERS)** for direct **detection of trace of polarizable analytes** and **indirect detection by signal variations for non-polarizable analytes** using crystal violet (CV).[1]
- In a previous work from our groups, where AgNSs were deposited **in bare substrates**, enhancement factors of an **≈ 10^4** were obtained, using crystal violet, with a 532 nm laser.[2]
- Our objective here is to optimize the fabrication process of **SERS nanoplatforms (NPEP)** based on **silver nanostars** (AgNSs)[2,3] by varying parameters such as **i) concentration of AgNSs, ii) Morphology of AgNSs, iii) solvent**; and to **evaluate SERS efficiency of the best nanoplatforms**.

Protocol

The nanoplatform fabrication is based on **centrifugation[2] of AgNSs suspension (figure 1) on top of borosilicate glass** with 9 mm of diameter. The fabrication process was optimized by **varying the parameters** shown in **table 1**.

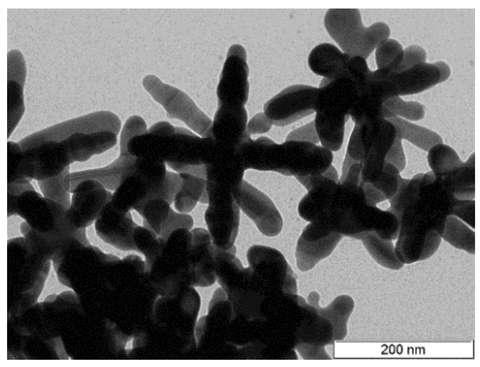

Figure 1 - TEM micrographs of AgNSs suspension.

Table 1 - Nanoplatforms fabrication parameters.

Samples	AgNSs274 / mL	MetOH / mL	Centrifugation cycles
A	0.1	0.2	1
B	0.1	0.2	2
C	0.1	0.2	3
D	0.2	0.4	2
E	0.5	1.0	1

Main Results and Conclusions

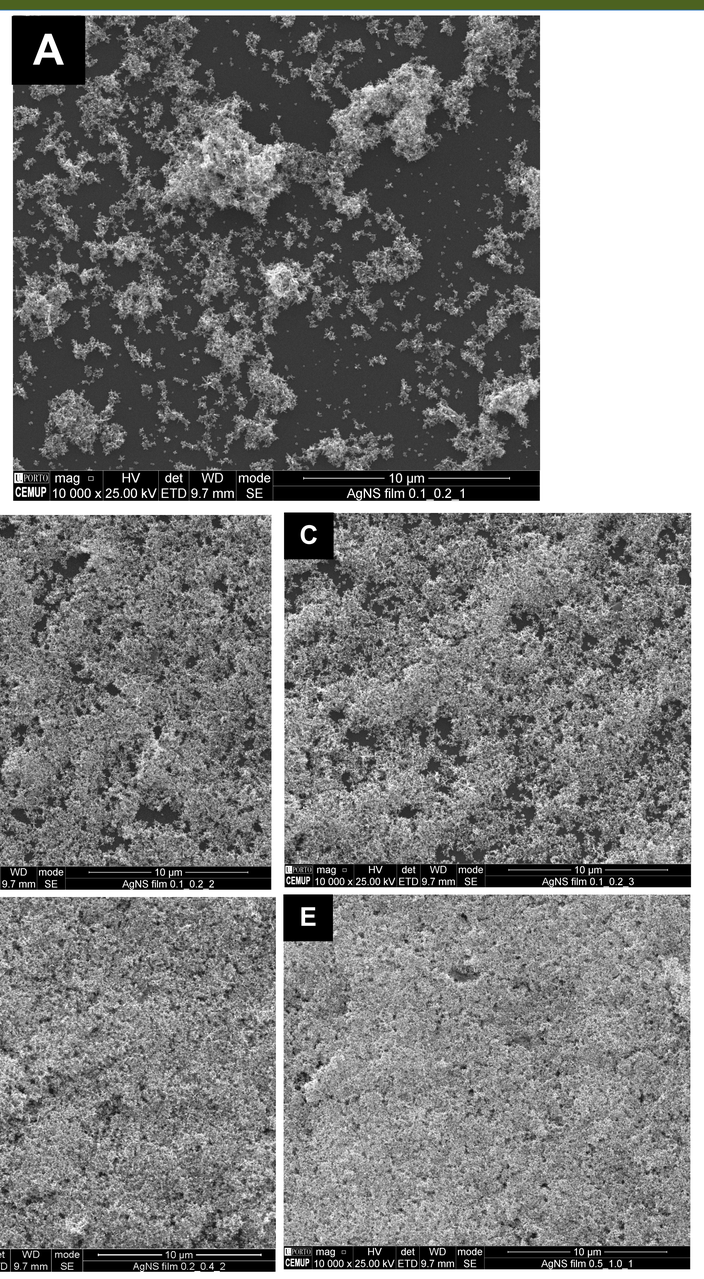

Figure 2 - SEM micrographs of nanoplatforms surfaces.

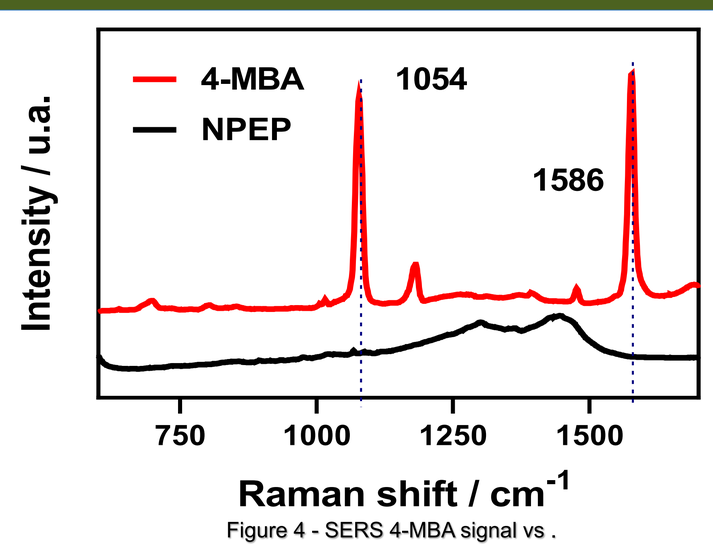

Figure 4 - SERS 4-MBA signal vs .

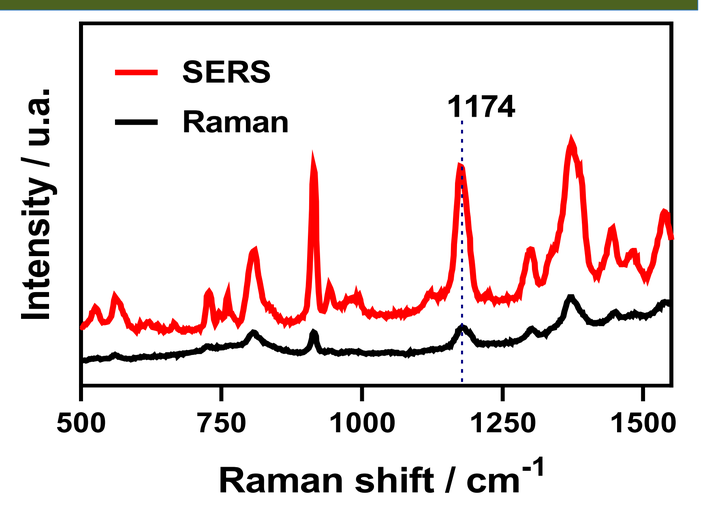

Figure 5 - SERS vs Raman crystal violet signal.

- These nanoplatforms can be considered **high-performance, low cost and reproducible** for SERS analysis.
- Scanning electron microscopy (SEM) micrographs show (figure 2) that **sample A** is the surface with the **visually more heterogeneous than others.**
- The SERS signal (**4-MBA peak area**) variation shows a **lowest %SD for sample A** (intra and inter-sample). **Contrary** to expectations**,** (that more films nanoparticles added results in best surface signal homogeneity)**.** In fact**,** **it is the opposite** (more films results in **worse surface signal homogeneity**)**.**
- **Sample A** is the easier to fabricate and **uses less amount** of AgNSs and MetOH as table 1 shows. Also, that sample shows **Raman enhancement of 8.9 x 10^6** .

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[3] C. Espinha, "Plasmonic Nanoparticles for Sensitive Detection By Surface Enhanced Raman Spectroscopy (SERS)", Dissertação de Mestrado em Física Médica, Faculdade de Ciências da Universidade do Porto, 2018.

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