Synthesis and functionalization of silver and gold nanoparticles for virus detection

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For the preparation of nanostructures which allow for the detection of adeno-associated virus (AAV) at different phases of development in insect cells, by Surface Enhanced Raman Spectroscopy (SERS), metal nanomaterials have been synthesized. In particular, plasmonic gold and silver nanoparticles (NPs) have been prepared in bare and functionalized forms. Gold NPs possess high biocompatibility and stability [1]. They are upon functionalization, appropriate for intracellular detection of AAV. Silver NPs, on the other hand, are cheaper to prepare, but typically more toxic. They are suitable for extracellular AAV detection, and as such they can be used in their 'bare' form. In addition, they can have a more general applicability, since they can have antimicrobial properties, and also used for chemical sensing [2].
In this work, different strategies for the synthesis of silver and gold NPs are presented, aiming at obtaining uniform structures with optimized plasmonic properties for SERS. The NPs are characterized by ultraviolet-visible (UV-VIS) spectroscopy, dynamic light scattering (DLS) and transmission electron microscopy (TEM). Thiol groups form strong metal-S bonds and allow for further functionalization of the NPs. They have been widely used to functionalize metal NPs for biomedical applications [3]. For our purpose thiol-functionalized gold NPs facilitate the attachment of antibodies and other groups (raman reporter group or cell penetrating peptides), which will allow indirect, intracellular detection of AAV. For this reason, we also report here the thiol-functionalization of the prepared gold NPs, following several functionalization strategies.

REFERENCES

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FIGURES

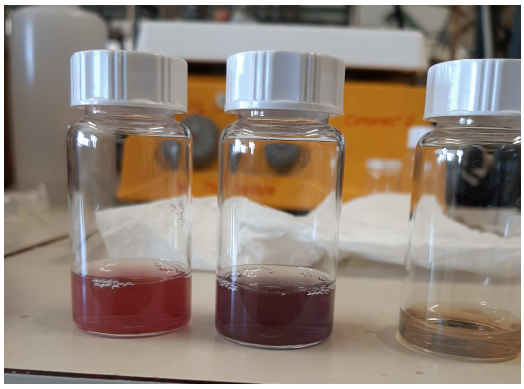

Figure 1: Gold (left and middle) and silver (right) nanoparticles.