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Surface-enhanced Raman spectroscopy (SERS) is a well-established optical technique able to detect unique vibrational information from a wide variety of chemical and biochemical species in different environments including aqueous media and biological fluids. The well-known enhancement effect of SERS is associated with the presence of metallic nanostructures at the substrate surface. Different bottom-up and top-down processes have been proposed to impart the substrate with such a nanostructured layer. The former approaches are low cost but may suffer from reusability and stability. The latter strategies are expensive, time consuming and require special equipment that complicate the fabrication process.

Here, we present the possibility to obtain stable and reusable SERS substrates by a low-cost silver-sodium ion-exchange process in soda-lime glass microrods. The microrods were obtained by cutting the tip of the ion-exchanged soda-lime fiber, resulting in disks of about few millimeters in length and one hundred microns in diameter. A thermal annealing post-process was applied to trigger the reduction of Ag+ ions into Ag nanoparticles (NPs) within the ion-exchanged glass microrods. Afterwards, ion-exchange and thermal treatments were carefully tuned to assure the presence of embedded silver NPs exposed on the surface of the microrods, without using any chemical etching. An Atomic Force Microscopy (AFM) analysis confirmed the presence of silver NPs with size of tens of nm on the surface of the fiber probe.

Initial SERS measurements on the glass fiber tip after incubation with 4-methylbenzene thiol (MBT) were carried out to test the efficacy of the ion-exchanged and annealed fiber in generating effective SERS responses. Then, a SERS affinity bioassay was developed on the probe with the final aim of detecting microRNA fragments acting as biomarkers of different diseases. Specifically a DNA hybridization assay was built up by anchoring a molecular beacon containing a Raman tag on the Ag surface *via* thiol chemistry. Initial SERS experiments confirmed the presence of the beacon on the NPs embedded on the microrods surface, as monitored by detecting main spectral bands ascribed to the oligonucleotide chain. Finally, the ability of the platform to interact with the target microRNA sequence was assessed. The analysis was repeated on a number of miRNA sequences differing from the target to evaluate the specificity of the proposed assay.

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