Functionalization of NPG for SERS Applications: a new sensor for HSA detection

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The development of a new generation of ultra-sensitive sensors for analytical and bio-diagnostic devices requires a strong signal in front of a very small quantities of material. Taking advantage of peculiar plasmonic properties of nanoporous gold (NPG), a promising sensor for selective detection of Human Serum Albumin (HSA) has been prepared by a proper functionalization of this substrate.

NPG has been synthesized by electrochemical de-alloying an amorphous precursor, $Au_{40}Cu_{28}Ag_7Pd_5Si_{20}$, starting from melt spun ribbons. A fully de-alloyed ribbon with ligaments of around 200 nm was obtained after 6 h of de-alloying in proper conditions of potential, temperature and concentration of the electrolyte [1,2]. This material is self-standing and mechanical resistant and then well-versed for applications. At this stage, NPG is SERS active toward probe molecule i.e. pyridine, bi-pyridine, rhodamine even in very low concentration, but not specific for other complex molecule of interest such as HSA. Ad hoc functionalization is then required for this purpose.

Bare NPG has been bounded with a selective ligand i.e. a target-directed antibody (anti-Human Serum Albumin, Ab anti-HSA) covalently grafted onto the gold surface and then tested by Surface Enhanced Raman Spectroscopy (SERS) measurements as a function of HSA concentration.

Preliminary results on the activity and sensivity have been reported.

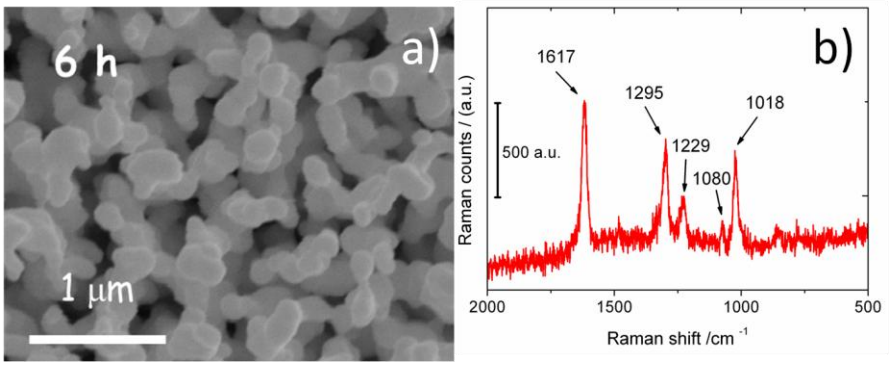

Fig.1. a) High resolution SEM image of NPG and
b) SERS spectra of 10^{-8} M 4,4'-bipyridine in ethanol
on ribbon de-alloyed for 6 h.

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References

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[2] P. Rizzi, F. Scaglione and L. Battezzati , J Alloys and Comp. 586S (2014).