SiNWs/Ag nanostructures fabricated by a single step MACE process for the detection of biological substances

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Silicon nanowires (SiNWs) made by metal-assisted chemical etching (MACE) produce 3D surfaces offering a high surface-to-volume ratio with numerous applications in photonics, photovoltaics, nanoelectronics and sensor applications [1]. In the present work, we developed SiNWs by MACE and decorated them with silver nanoparticles in order to explore their potential as active substrates for sensitive molecule detection by Surface-Enhanced-Raman-Scattering (SERS) and Photoluminescence (PL) taking advantage of the local electric field enhancement within the nanogaps between silver nanoparticles [2]. The right choice of the laser wavelength and the metal determines the optimal enhancement in both techniques as the excited plasmons must be at resonance with the laser wavelength. In order to evaluate the substrates' performance, SERS measurements were carried out for two oxidative stress markers Glutathione (GSH) and Malondialdeyde (MDA). The substrates demonstrate strong SERS signals at low concentrations of the substances under investigation. Furthermore, PL measurements were carried out for the immunochemical detection cancer biomarker CA-125.Our results show that Ag decorated SiNWs fabricated by MACE offer a promising substrate for SERS and PL detection of biological analytes

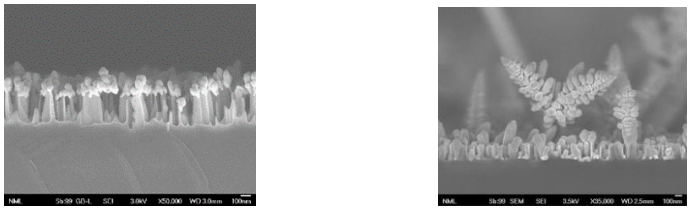

Figure 1: SEM images of the silver nanoparticles grown on SiNWs.

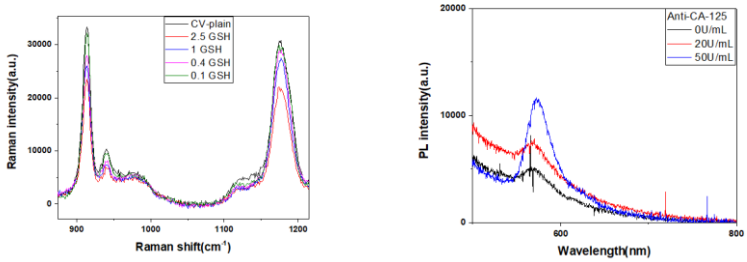

Figure 2: a) Raman spectra of GSH, b) PL spectra of Anti-CA-125

References

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[2] Q. Fu, D. Zhang, Y. Chen, X. Wang, L. Han, L. Zhu, P. Wangand, H. Ming, Appl. Phys. Let .xxx (2013)

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