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Supporting Information

Triggering gold nanoparticles formation on a quartz surface by nanosecond pulsed laser irradiation

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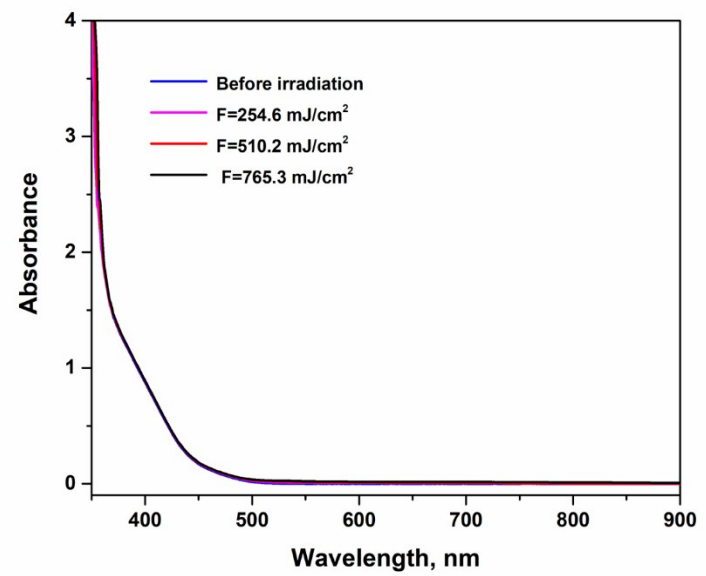

Fig.S1. Absorption spectra of a 0.4 mM $HAuCl_4$ aqueous solution before and after laser irradiation using 3000 laser pulses, 10 Hz frequency rate and different laser fluence (F) values indicated in the inset of the figure. The surface irradiation area was 0.196 cm^2 in all cases.

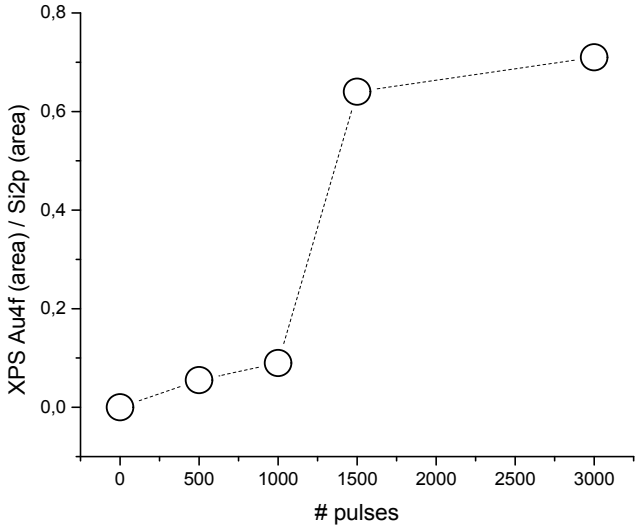

Fig.S2. Au4f / Si2p ratio as a function of the number of pulses (F= 510.20 mJ/cm^2) showing the abrupt increment in the concentration of gold nanoparticles after 1000 pulses. The peak areas were corrected by RSF.

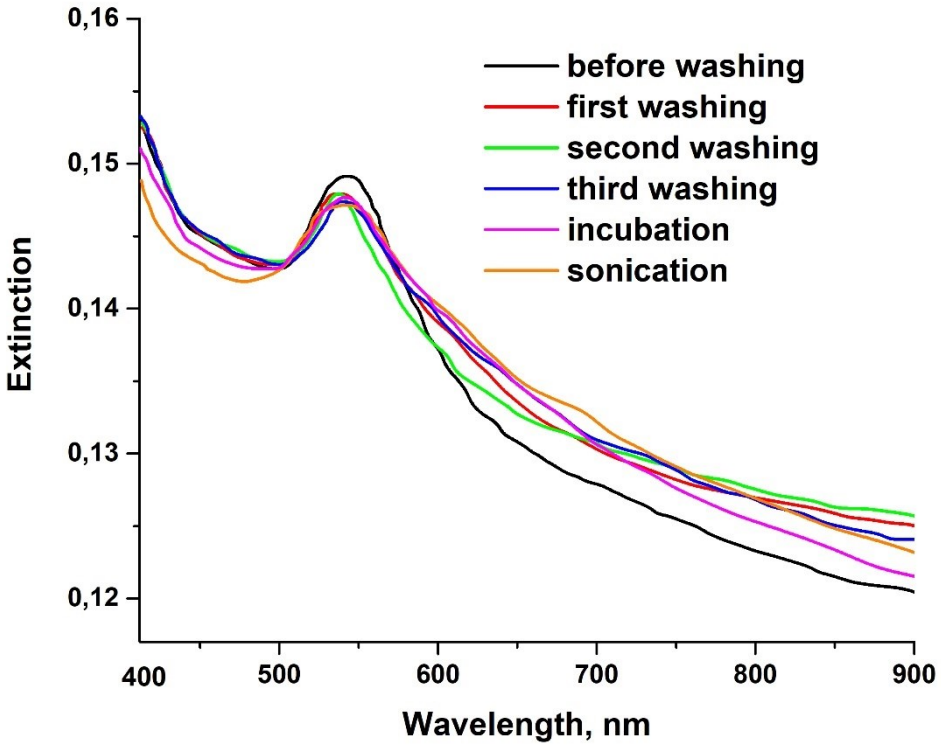

Fig. S3. Extinction spectra of the Au NPs_Q before (black line) and after different sequential procedures:

a) the Au NPs_Q was mechanically and continuously washed using a wash-bottle with Milli-Q water for 30 seconds.

b) After the first wash step, the same procedure was performed 2 more times.

c) After the above washing steps, the Au NPs_Q, substrate was incubated in water for 2 h, at room temperature.

d) After performing the above washing procedures, the Au NPs_Q was sonicated for 1 min.

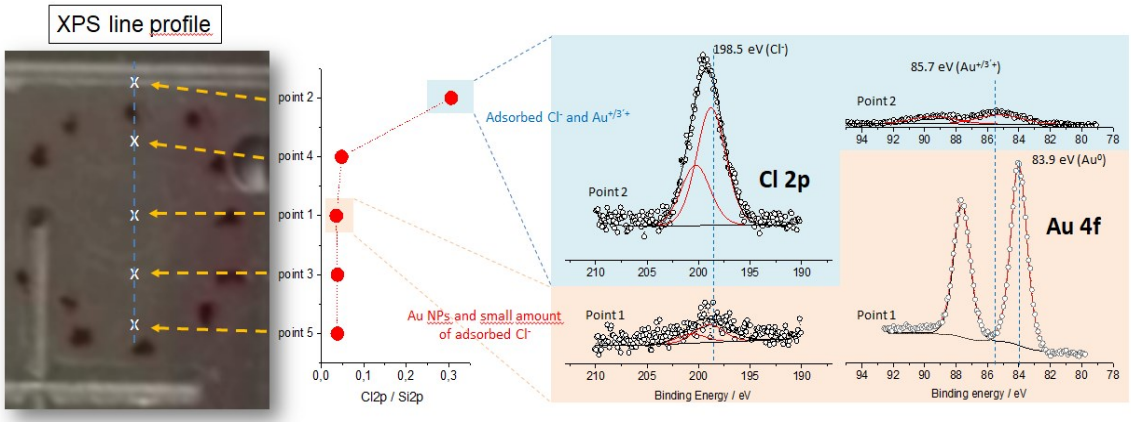

Fig.S4. XPS line profile. In the left panel, we present a photography taken inside the XPS vacuum chamber of a quartz sample that was irradiated with 3000 laser pulses in contact with $HAuCl_4$ solution (F= 510.20 mJ/cm^2). The red dots enclose the area of impact of the laser beam and the "x" white markers describe the position where XPS spectra were performed (the center position of the elliptical X-rays light). It can be observed that the maximum amount of Au atoms on the surface takes place at the center of the circle formed by the red dots (point 1). Also, the amount of chlorides adsorbed on this point is almost negligible. In contrast, the point just outside the circle (point 2, where the laser beam does not impact directly, but the surface is immersed in the $HAuCl_4$ solution), the amount of Cl- increases remarkably. Therefore, it is demonstrated that ions (Cl- and $Au^{1+/3+}$) are adsorbed on the quartz surface before laser application and then, chlorides are desorbed from the surface and gold cations are reduced after laser pulses.

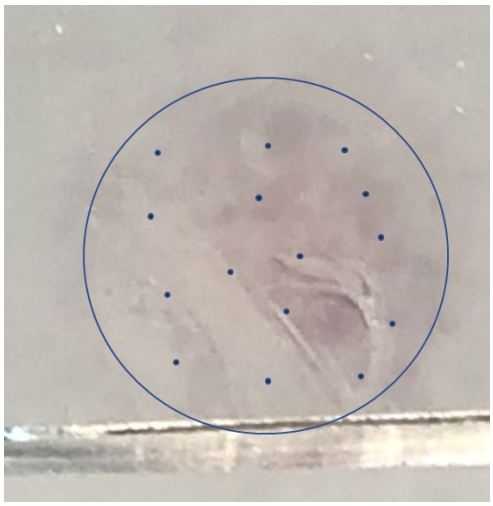

Fig S5. Photography of the Au NPs_Q substrate after its incubation with Rhodamine 6G. The blue dots are the roughly spatial region chosen to record each Rhodamine SERS spectrum. The blue circle is a guide-line for the eye.