Surface Enhanced Raman Scattering, from labeling toward an analytical technique

Lucio Litti
Javier Reguera, Moreno Meneghetti, Luis Liz-Marzan

Department of Chemical Sciences, University of Padova, v. Marzolo 1, 35131 Padova, Italy)

lucio.litti@unipd.it

Surface Enhanced Raman Scattering arises when an exciting electromagnetic field resonates with localized plasmons of nanostructured surfaces. Molecular species experience enhanced local fields on the surfaces and the Raman scattering is amplified. Aggregated Gold nanoparticles,[1] as well as Gold nanostars,[2] are examples of some of the best candidates as colloidal SERS substrates. Labeling [3] or contrast agents [4], both in vitro or in vivo, have shown to be efficient when based on such substrates. The evolution of SERS toward a reliable quantitative technique is now attracting attention, due to the information present in the vibrational spectrum and the possibility to run measurements in aqueous samples. From previous experience on un-functionalized substrates,[5] a novel strategy for a quantitative assay based on a competitive approach was developed.[6] Janus magnetic/plasmonic FeO_x/Au nanostars (JNS) are here presented as successful colloidal SERS substrates for quantification of several analytes within the nano-micromolar range. Their magnetic behaviour was found useful for remote-controlled sample concentration within a microfluidic device, while their superior SERS activity was used for the quantification.

References

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Figures

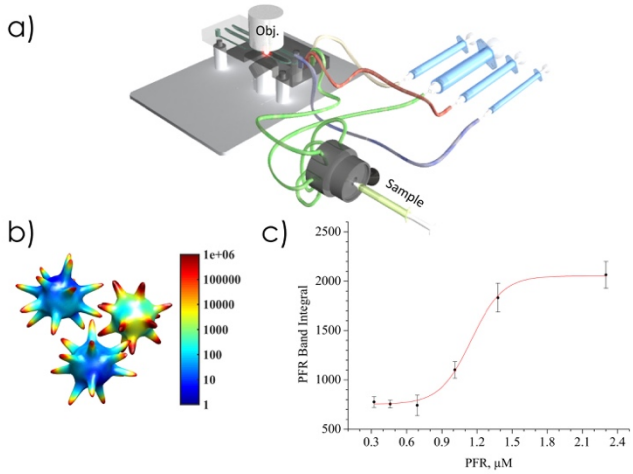

Figure 1: a) representation of the 3D printed microfluidic device in which the JNS interact with the analyte and concentrate at the magnet before the Raman measure; b) Boundary Element Method based simulations show high local field enhancements at the star tips; c) calibration curves of several analytes can be obtained within the nano-micromolar range.