Supramolecular mediated self-assembly of gold nanoparticles for selective SERS detection

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Abstract

Pillar[5]arenes are a new class of macrocycles, first synthesized in 2008 by Ogoshi,[1] with interesting host-guest capabilities.[2] On the other hand, Au nanoparticles based systems are powerful SERS sensing platforms for the detection and identification of a wide range of analytes.[3] As recently reported, the combination of Au nanoparticles and pillar[5]arene can give rise to synergistic effects with great potential in selective SERS based detection of molecules.[4] Herein, we propose the fabrication of a novel sensing plasmonic platform through the assembly of Au nanoparticles directed by pillar[5]arene through electrostatics (see Figure 1). Since the assembly is a multistep process the optical properties, localized surface plasmon resonance (LSPR), can be easily modulated along the VIS-NIR range by varying the amount of Au deposited. Finally we analyze the SERS efficiency with a wide range of laser lines (532, 633, 785, 830 and 1064nm) demonstrating the importance of LSPR frequency on the SERS activity. We also demonstrate the dependence of the SERS response on the refractive index of the surrounding media. This kind of studies, not usually accomplished, provides accurate information of plasmonic platform which contributes to elucidate the relationship between optical properties and SERS efficiency in hot-spot containing systems.

References

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[3] R. A. Álvarez-Puebla and L. M. Liz-Marzán, Small, **6** (2010) 604.
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Figures

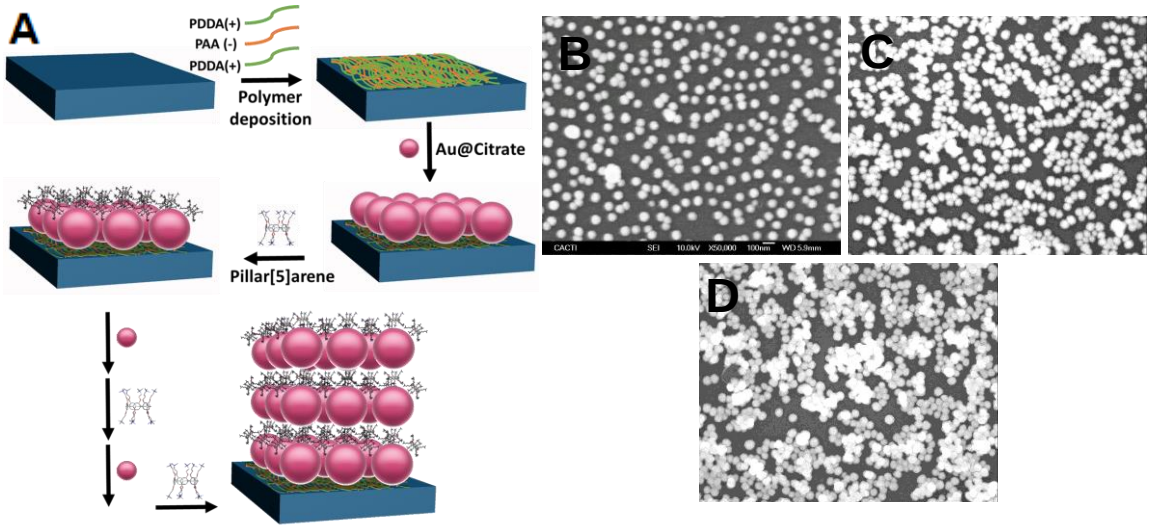

Figure 1: a) Schematic representation of the synthetic route where Au nanoparticles are deposited through electrostatic interactions in a multistep process. b-d) SEM images of the plasmonic substrate with 1, b); 2, c) or 3, d) additions of Au nanoparticles