O-15

A NOVEL SILVER-QUANTUM DOTS "SPONGE" NANOCOMPOSITE AS SERS-ACTIVE SUBSTRATE

Carolina Carrillo-Carrión[a,b], Bartolomé M. Simonet [b], Miguel Valcárcel[b], Bernhard Lendl[a] [a]
Institute of Chemical Technologies and Analytics, Vienna University of Technology, Getreidemarkt 9/164AC, A-1060 Vienna, Austria. Bernhard.Lendl@tuwien.ac.at
[b] *Department of Analytical Chemistry, Campus of Rabanales (Anex-C3), University of Cordoba, E-14071 Cordoba, Spain. qa2sisub@uco.es*

This work reports the evolution of a new class of composite, Silver-Quantum Dots (Ag-QD) structures for surface enhanced Raman scattering (SERS) study. The use of QDs as reducing agent to produce silver colloid suspension as SERS substrate has not been reported yet. Here, the new Ag-QD SERS-active substrates with high enhancement were prepared by an *in situ* reduction method using CdSe/ZnS QDs as reducing agent of the Ag(I) ions to Ag(0). Besides acting as reductant the QDs are incorporated into the structure resulting in Ag-QD composites. The synthesized Ag-QD colloid has been characterized by UV-vis spectrometry, scanning electron microscope (SEM), transmission electron microscopy (TEM), energy dispersive X-ray analysis (EDX), electron diffraction, and SERS. A surprising finding is the particular sponge-like morphology of the new synthesized material which provides a high density of "*hot spots*". They have been found to be highly efficient for SERS, even it enables the detection of a selected dye molecule down to single molecular level. Moreover, the SERS activity of these colloids was tested using various analytes and compared with those exhibited by the Leopold-Lendl silver colloid. Additionally, the new Ag-QD (compared to the common Ag colloid) establishes a relationship between the morphology (size, shape and spacing between particles) on the enhancement of SERS spectra, which provides further insight into the enhancement mechanism of SERS.

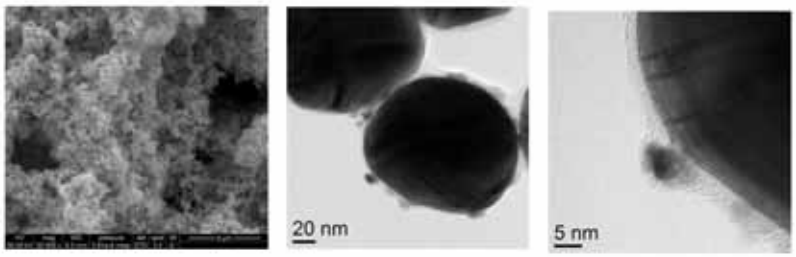

Figure 1. SEM and HTEM micrographs of the synthesized Ag-QD composite.

Assessment of the silver-colloid-QD dispersion using rhodamine-6-G showed that the SERS enhanced signal was stable with time, which is important for quantification of SERS results. Additionally, where very low concentrations of rhodamine-6-G were used the periodicity of the SERS signal intensities obtained indicates that single molecule detection is achievable (Fig. 2).

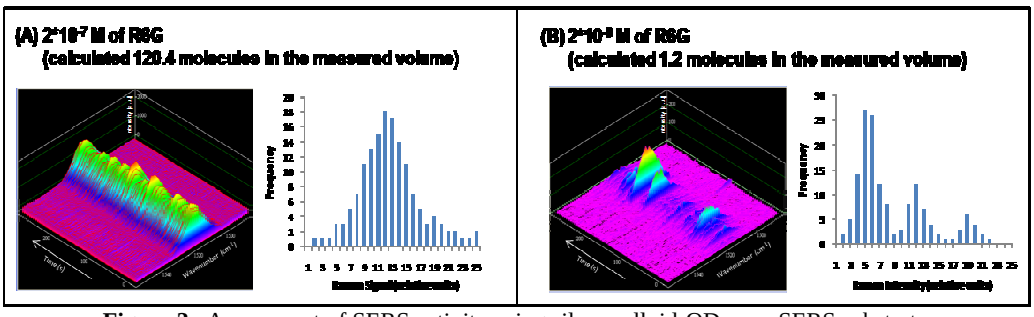

Figure 2. Assessment of SERS activity using silver colloid-QDs as a SERS substrate.