

## Surface-Enhanced Raman Scattering from a Single Molecularly-bridged Silver Nanoparticle Aggregate

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SERS (Surface-enhanced Raman Scattering) spectroscopy in systems with Ag nanoparticles has recently become a subject of reinforced interest stemming from achievement of single molecule level of detection. While the most efficient amplifiers have been proposed and proven to be Ag nanoparticle dimers [2,3], the frequently encountered small aggregates of Ag nanoparticles with several „hot spots“ are of interest from both the theoretical [4] and experimental point of view as well.

In this contribution, we report temporally fluctuating SERS signals originating from a particular small aggregate of 4,4'-diaminoterphenyl (DATP)-bridged Ag nanoparticles. An unequivocal correspondence between the morphology of the nanoobject and SERS signal obtained from it with a confocal Raman micro-spectrometer was ensured by assembling samples of widely spaced small Ag nanoparticle aggregates on chemically functionalized, SiO<sub>x</sub> coated finder grids for TEM, and by determination of the selected aggregate position with respect to the markers of a particular mesh of the finder grid. Samples were assembled on 3-aminopropyltrimethoxysilane (APTMS)-derivatized, SiO<sub>x</sub> coated Cu grids by a three step procedure involving (i) Ag nanoparticle attachment to APTMS-derivatized grids, (ii) attachment of DATP linkers to Ag nanoparticles by one terminal amine group, (iii) attachment of Ag nanoparticles to the second terminal amine group of the linker. TEM image

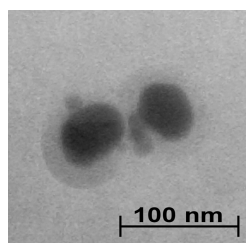


Fig. 1

of a selected single aggregate of DATP-bridged Ag nanoparticles and the temporally fluctuating SERS signal obtained from it at 514.5 nm excitation are shown in Figs. 1 and 2, respectively. The aggregate is constituted by a trimer of small particles interlocked between two larger particles (Fig. 1). Time-evolution of SERS-signal measured from this aggregate shows temporal fluctuations, in which the signal of DATP alternates with that of graphitic carbon, represented by two distinct, rather broad bands (Fig.2). The time-evolution of the SERS signal indicates that the bridging diaminoterphenyl molecule decomposes to graphitic carbon in at least one of the "hot spots" within the aggregate.

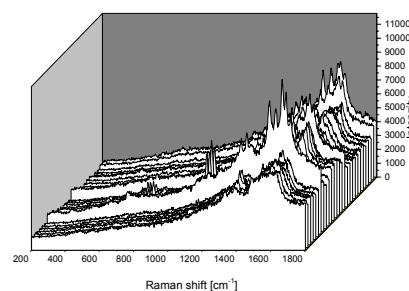


Fig. 2

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