

BOOK OF ABSTRACTS

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DITHIOTHREITOL INDUCING GOLD NANOSTRUCTURES FORMATION

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Gold nanostructures (AuNSs) possess unique optical properties. When preparing them from individual atoms (i.e. by bottom-up synthetic pathway), one can generate either nanoclusters or nanoparticles based on the conditions of synthesis. While Au nanoclusters (AuNCs) can reveal luminescence in the visible region of electromagnetic radiation; Au nanoparticles (AuNPs) are well-known for their surface plasmon resonance band positioned also in the visible region that is convenient for AuNPs application, namely in surface-enhancement of optical phenomena – e.g. Raman scattering.

The aim of the present work is to investigate the role of dithiothreitol (DTT) in AuNSs preparation. It is known from the literature [1] that DTT can be used as both, reducing and stabilizing agent when interacting with Au (III) precursor. Therefore, in the present study, we focused on the selected five molar ratios of Au (III) : DTT (1:3, 1:2, 1:1, 2:1, and 3:1) under four relevant pH values (7, 8, 9, 10). Several spectroscopic and microscopic methods available in our labs were used for AuNSs characterization, such as: UV-Vis spectroscopy, dynamic light scattering, zeta potential measurements, steady-state fluorescence spectroscopy, Raman spectroscopy, infrared absorption spectroscopy, and transmission electron microscopy. From the results, it can be stated that the molar ratios of 1:3 and 1:2 of Au (III): DTT resulted in AuNCs formation, whereas the excess of Au (III) led to AuNPs generation. Both types of AuNSs were obtained in pH values varied between 8-10. Molar ratio of 1:1 of Au (III): DTT led most probably to the complexation of Au (III) with DTT since no AuNCs, nor AuNPs formation was observed. The successfully formed AuNPs served as efficient surface-enhanced Raman scattering substrates for a selected model adsorbate (anionic porphyrin) detection in 0.1 μM final concentration. It is envisaged that this type of AuNPs synthesis could be further exploited in magneto-plasmonic nanocomposite generation.

References

[1] A. O. Lundgren, F. Björefors, L. G. M. Olofsson, H. Elwing, Self-arrangement among charge-stabilized gold nanoparticles on a dithiothreitol reactivated octanedithiol monolayer. *Nano Lett.* 8, (2008) 3989-3992. doi:10.1021/nl802543g

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