Nanoplasmonics and surface enhanced spectroscopy

Experiment and modeling of "star-like" plasmonic nanostructures for SERS application

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Surface-enhanced Raman spectroscopy (SERS) is an effective analytical method that is commonly used in diagnostics of substances in chemistry, material science, medicine, biology, pharmacology, ecology, homeland security etc [1].

Star-shaped plasmonic gold nanostructures (NSs) were synthesized by chemical methods for SERS application [2]. Their morphology, absorption spectra and efficiency of the Raman signal enhancement of molecules were investigated.

SEM and TEM studies have shown that obtained NSs possess "star-like" form with core in the centre and cones on its surface. Arrangement of NSs on the surface of SERS substrate is quite dense that causes the formation of so-called "hot spots", where the intensity of electric field is much higher than its average value, which is caused by superposition of electric fields of nearly placed NSs.

Absorption spectra of obtained NSs have shown intense plasmonic absorption peak with a maximum at 600 nm. It was shown that SERS-substrates with such NSs effectively enhance scattered Raman signal of molecules by using lasers with wavelengths 632 nm, 532 nm as the excitation source. Computer modeling by finite element method calculated the distribution of electric fields near NSs. This helps us to optimize morphological parameters of NSs during their synthesis and deposition on glass substrates for more effective enhancement of the Raman signal.

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2. *Ndokoye P., Li X., Zhao Q., Li T., Tade M. O., Liu S.* Gold nanostars: Benzyldimethylammonium chloride-assisted synthesis, plasmon tuning, SERS and catalytic activity // J. of Col. and Interface Sc.-2016.-**462**,-P. 341-350.