Nanoplasmonics and surface enhanced spectroscopy

Efficient interferential photolithographic method of SERS substrates production

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In recent years the role of physicists essentially increased in the study of biological objects and drugs control, in ecological and medical studies. The spectroscopy of the Surface-Enhanced Raman Scattering (SERS) of light [1] became particularly popular, because of its possibility of characterization of the properties of different substances available in submolar quantities.

The technique of production of SERS substrates with the laterally ordered gold nanoislands by high-resolution photo- and electronic lithographic methods was developed. However, their production is, usually, carried out in single copies or demands the hi-tech equipment like the electronic photolithography that is rather expensive. At the same time, the interferential lithography (IL) is simpler and more technologically efficient, and it can be used for formation of the arranged metal nanostructures. This method allows developing cheap and productive technology of formation of arranged plasmon nanostructures that can be used as SERS substrates.

Using IL method SERS substrates with laterally-arranged gold nanostructures for different spectral regions of the visible light were formed. For this purpose such parameters of SERS substrates as: sizes of gold nanoislands and distances between them were adjusted to design SERS substrates for different wavelengths of laser radiation: 457, 532, 632 and 780 nm.

Morphological parameters of obtained SERS substrates were studied by atomic force and scanning electron microscopy. At the same time, optical absorption measurement was done, to establish the position of the maximum of plasmon absorption band of the formed SERS substrates. Raman studies have shown that SERS substrates obtained by IL method are highly effective platform for the enhancement of the Raman signal of different molecules and/or nanoclusters deposited on their surface.

1. *T. Y. Jeon, D. J. Kim, S.-G. Park, S.-H. Kim and D.-Ho Kim.* Nanostructured plasmonic substrates for use as SERS sensors // Nano Convergence.-2016.-**3**, N 1.-P. 18.