Nanoplasmonics and surface enhanced spectroscopy

SERS spectroscopy using propagating surface plasmons: a new experimental approach

G.V. Beketov[1], O.V. Shynkarenko[1], V.O. Yukhymchuk[1]

[1]V. Lashkaryov Institute of Semiconductor Physics, Natl. Acad. of Sci. of Ukraine. Prospect Nauky, 41, Kyiv-03028, Ukraine.
E-mail: gbeketov@ukr.net.

Surface-enhanced Raman scattering (SERS) on flat metallic surfaces is demonstrated using an original experimental configuration.

SERS overcomes the major drawback of the regular Raman spectroscopy, the low quantum efficiency, that makes it an effective analytical technique for use in many areas [1].

Analytical applications of SERS usually suffer from irreproducibility of nanopatterning employed for manufacturing of the Raman enhancing substrates, and from the uncertainty in orientation of molecular species relatively to the electromagnetic field of exciting laser radiation. The flat metallic surface, as the most controllable and best understood plasmonic system, is a promising alternative for quantitative SERS applications. Electromagnetic SERS enhancement on flat surfaces can be achieved by excitation of propagating surface plasmons at a metal/dielectric interface.

In this report, feasibility of SERS on flat metallic films is demonstrated with a simple and efficient setup based on the Kretschmann configuration that ensures the full collection of the scattered Raman light. The advantage of this approach is the possibility of performing SERS with uniform and predictable enhancements on flat planar metallic films.

The representative spectra of selected molecular substances are obtained and the resulting electromagnetic enhancement factor is compared to that of the nanostructured SERS substrates.

1. Surface-Enhanced Raman Scattering – Physics and Applications / editors: *K. Kneipp, M. Moskovits, H. Kneipp* // Series: Topics Appl. Phys. – Berlin; Heidelberg : Springer-Verlag, 2006. – v.**103**.