Belarusian State University
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SERS-active substrates based on plasmon nanomaterials

Type of collaboration

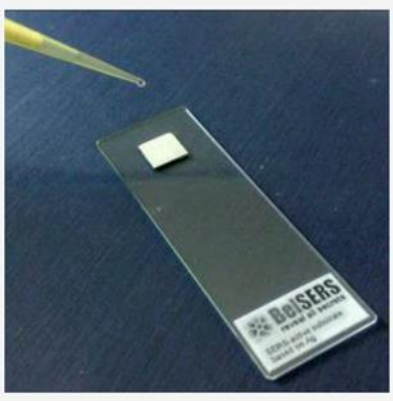
manufacturing agreement
(batches of various volumes)

Key words

SERS, substrates, nanomaterials, silicon

State of IPR

Patent applied



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SERS-active substrate is a nanocomposite material composed of surface-modified silicon by a nanostructured layer of silicon-, metal oxide- or polymer-based structures (porous silicon, nanowires, and nanowalls) covered by nobles metals in their various forms.

Area of the SERS-active region: from 0,01 to 1 cm^2.
Area of the finished substrate: from 0,5 to 9 cm^2.

Application: express analysis in medicine, biomedicine, criminology application, determination of explosives and narcotic substances in samples, doping control, monitoring of the state of wastewater, food and pharmaceutic quality control.

Buyers: universities, institutes, research organizations, and private companies.

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Project description

The main differences between the developed SERS-active substrates and their analogues on the market (SERS substrates Hamamatsu, Sersitive, Oceaninsight):

- The detection limit was improved by 6 orders of magnitude (10^{-6} — 10^{-18} M, depending on the analyte).
- The deviation of the SERS signal intensity was improved by at least 7 % and does not exceed 13 % for different points on the same substrate and different substrates.
- The reproducibility of the SERS spectra of high-molecular compounds for different points on the same substrate and different substrates was improved by at least 30 % and is at least 60 %.
- The shelf life was increased by 12 times and is up to 36 months.

The use of an intermediate layer based on highly ordered ensembles of silicon nanostructures to set geometric parameters and increase the oxidation resistance of SERS-active nanoparticles allows the production of substrates in compliance with the customer's requirements for the analysis of a specific substance (high-molecular compound, physiological fluid, etc.) and measurement modes.

The compatibility of the substrate manufacturing process with MOEMS technologies significantly reduces the cost of the fabrication process compared to the cost of the commercially available analogues, and also opens up the possibility of the integration of the SERS-active region into optical and electronic elements on a silicon chip and design microfluidic devices such as lab-on-chip.