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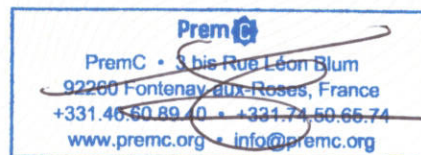
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DR. ANDREI NOVIKOV

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**UPGRADED NANOPARTICLE-BASED SERS SUBSTRATES:
SUPERHYDROPHOBICITY AND OXIDATIVE TREATMENT**

AT NANOPHOTONICS AND MICRO/NANO OPTICS
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Nanophotonics and Micro/Nano Optics International Conference 2018

 Conference Programme

Upgraded nanoparticle-based SERS substrates: superhydrophobicity and oxidative treatment

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Abstract

Introduction

Gold nanoparticles can be easily assembled to potent substrates for surface-enhanced Raman spectroscopy (SERS). We studied additional amplification of SERS signal by the oxidative treatment [1], and by providing the superhydrophobic properties of the substrates.

Methods

We have synthesized nearly spherical citrate-capped gold nanoparticles of different size from 20 to 120 nm by known method with modifications [2]. The maximum enhancement (above 10^6) in SERS experiments with 785-nm excitation (BWTEK BWS415) was provided by structures fabricated from 50-nm nanoparticles. Superhydrophobic substrates were produced by drop-casting of C18-silanized halloysite nanotubes dispersion.

Results

These nanoparticles demonstrated catalytic activity in oxidation of dyes with hydrogen peroxide, following the pseudo-first-order kinetics. In SERS-controlled catalytic experiments we observed additional enhancement, and the maximal one was observed with 3%(v/v) hydrogen peroxide. Exploiting this phenomenon, we detected model analytes at concentration of 5×10^{-9} M, while it was impossible without the hydrogen peroxide addition. Further improvement in the SERS substrates sensitivity was achieved by aggregation of gold nanoparticles on the superhydrophobic surface.

Discussion

The nanoparticle-based SERS substrates can be upgraded by making the hot spots available for adsorption of analyte, and by concentrating the analyte on the superhydrophobic surface. The substrates upgraded this way have the sensitivity more than an order higher in comparison with simple drop-casted substrates.

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1. M.V. Gorbachevskiy, D.S. Kopitsyn, M.S. Kotelev, E.V. Ivanov, V.A. Vinokurov, A.A. Novikov. *RSC Advances*, 2018, 8, 19051-19057.

2. N.G. Bastus, J. Comenge, V. Puntes. *Langmuir*, 2011, 27, 11098.

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Topic Areas

Photonic & plasmonic nanomaterials , Optical properties of nanostructures , Enhanced spectroscopy and sensing

Session

OS2b-2 » [Enhanced spectroscopy and sensing](#) (16:50 - Tuesday, 2nd October, ROOM 2)

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