Poster

FABRICATION AND CHARACTERIZATION OF SERS-ACTIVE GOLD, SILVER AND COPPER SUBSTRATES

Jitka Čejková[1], Vadym Prokopec[2], Soňa Brázdová[2], Alžběta Kokaislová[2], Pavel Matějka[2], František Štěpánek[1]

[1]Department of Chemical Engineering, Institute of Chemical Technology Prague, Technicka 3, 166 28 Prague 6, Czech Republic, jitka.cejkova@vscht.cz
[2]Department of Analytical Chemistry, Institute of Chemical Technology Prague, Technicka 5, 166 28 Prague 6, Czech Republic

Surface-enhanced Raman scattering (SERS) spectroscopy is a Raman spectroscopic technique that enables detection of low concentrations of chemical and biological agents adsorbed onto rough metal surfaces. This method provides greatly enhanced Raman signal, which can be *ca* million times more intense that ones without surface enhancement. It is widely recognized that the predominant mechanism of Raman enhancement relates to the electric field enhancement that occurs near small interacting metal particles illuminated with light that excites the surface plasmons in the metal. The fabrication of suitable SERS-active substrates with proper surface morphology which provides optimal enhancement of the analyte signal is a major challenge in SERS spectroscopy. In this work, different gold, silver and copper substrates were prepared using procedures consisted of electrochemical deposition of metal layer and further roughening with oxidation reduction cycles (ORC) treatment.

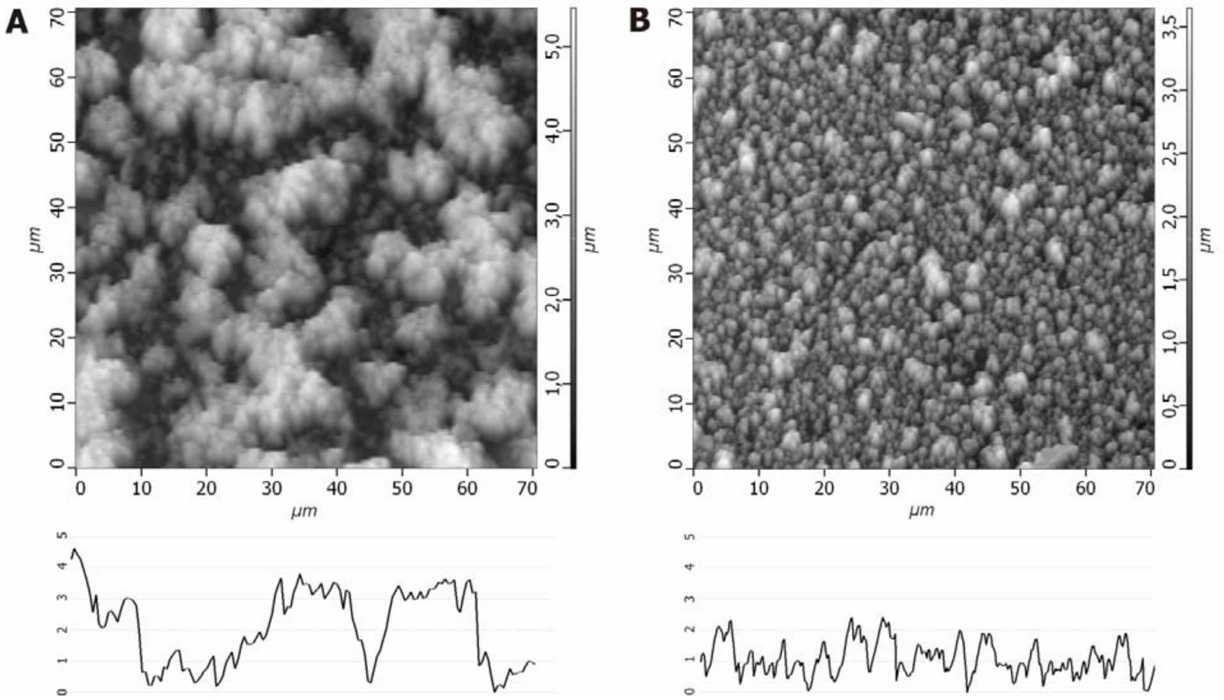
SERS-active substrates can be used for the construction of SERS-based sensors. The method of creating a selective sensing layer on a receptor surface is usually determined by physiochemical properties of the compound used. Ultra-thin sensing coatings can be prepared via attachment of reactive molecules that form on the surface of SERS-active substrate self-assembled monolayers (SAMs). In this study different derivatives of nicotinamides and tertiary amines which could serve as spacers for the selective receptors of saccharides and glykoproteins were used as modifying agents on the surface of prepared SERS-active substrates.

In present work, the nanometer scale surface structure of SERS-active substrates was characterized by using atomic force microscopy (AFM), in order to explain a relation between surface roughness and SERS enhancement. We have focused on fabrication optimization of the SERS-active substrates. We have tried to explain how the film structure affects the intensity of the Raman spectra of nicotinamides and tertiary amines adsorbed on these SERS-active substrates.

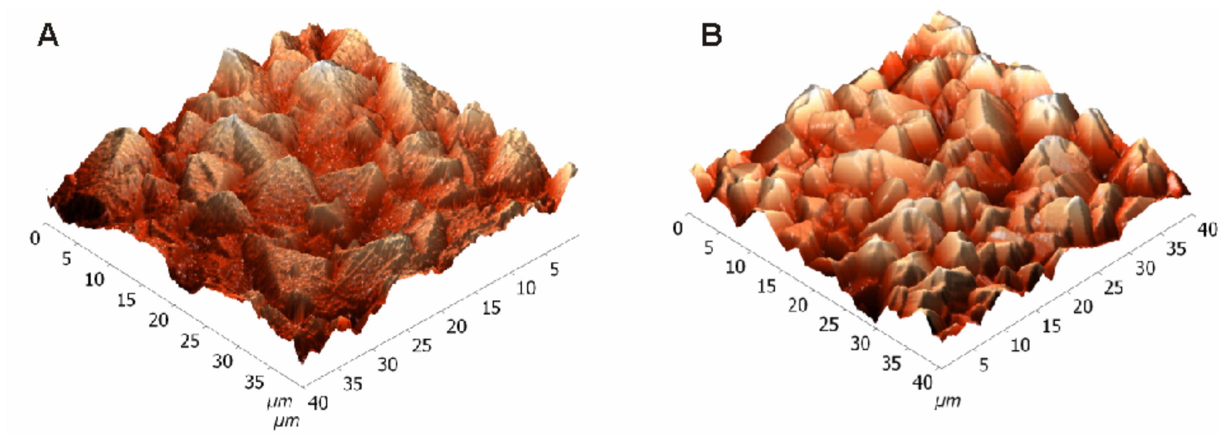
References:

[1] Smith, E. and Dent, G., Modern Raman Spectroscopy: A Practical Approach, (2005).
[2] Prokopec V., Cejkova J., Matejka P., Hasal P.: Surface and Interface Analysis, **40** (2008) 601-607.

Figures:



AFM images and section profiles of silver SERS-active substrates prepared according to different procedures. Images were scanned over the area 70 x 70 μm.



3D AFM images of copper SERS-active substrate surfaces. Substrates stored (A) in air and (B) in methanol solution. Images were scanned over the area 40 x 40 μm.