Design and characterization of new nanostructured surfaces as planar SERS sensors

Virginia Merk[a], Alexander Nerz[a], Sebastian Fredrich[a], Kristjan Leosson[b], Janina Kneipp[a]

[a]Department of Chemistry, Humboldt-Universität zu Berlin, Brook-Taylor-Str. 2, 12489 Berlin, Germany
[b]Science Institute, University of Iceland, Dunhagi 3, 107 Reykjavik, Iceland

Planar, nanostructured SERS substrates have become a basic tool for applications of SERS to analytical problems, as they permit reproducibility of SERS signals from an analyte. Here, we report on the construction of dedicated, planar SERS sensors based on different approaches namely the immobilization of nanoparticles on glass substrates via polymers [1, 2] and the gap size reduction in lithographically generated nanostructure arrays [3]. The nanoscopic and plasmonic characteristics of the different substrates are discussed. The optical properties, as well as the SERS enhancement factor of the resulting structures and their distribution at the microscopic level were characterized. The experimental results were supported by 3D finite-difference time domain (FDTD) simulations.
To show the potential of the mix-and-match surfaces, we have simultaneously immobilized separate gold and platinum nanoparticles on a glass surface and used them to map the kinetics of a catalytic reaction [4]. The approach enables us to compare reaction rate constants of different catalytic systems and the underlying kinetics such as the formation of the active species independent of the optical absorption properties of the reaction products and / or the catalysts.

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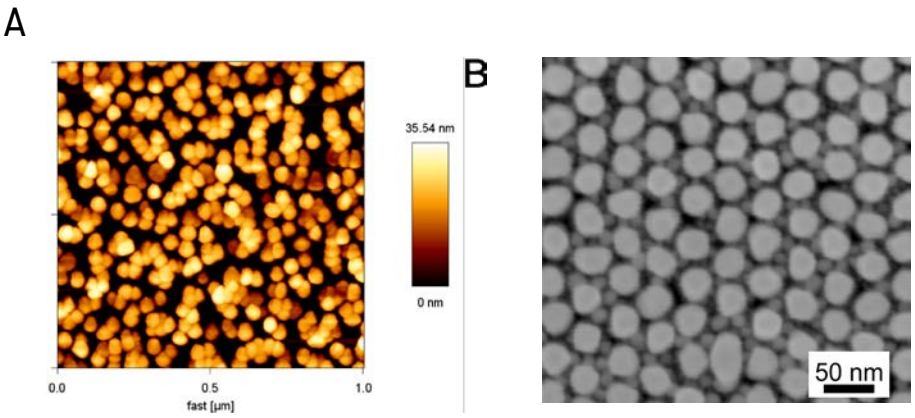

Figure A) *Scanning force micrograph of gold nanoparticles immobilized on a glass substrate using an aminosilane,* ***B)*** *Scanning electron micrograph of a dense gold nanostructure array resulting from templated growth of structures generated by electron beam lithography.*

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