Wide-field surface plasmon microscopy: a new tool for ultrasensitive analytics of natrural and artificial nanoparticles as well as for nanoelectrochemistry

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Abstract
The recently developed wide field surface plasmon microscopy (WF-SPRM) is a power tool for ultrasensitive analytics of large analytes (nano- and submicroparticles of natural and artificial origin, for example, viruses, exosomes, liposomese, polymeric or inorganic nanoparticles) as well as for investigation of electrochemical processes at the level of single nanoparticles [1-3]. In both cases the method allows one to follow up to a million of nanoparticles on the sensor surface simultaneously thus providing statistically reliable data for analysis with so high resolution. The first part of the talk will include a short review of analytical application of this approach including a quantitative detection of engineered nanoparticles in very complex media. Further, an application of WF-SPRM for nano electrochemistry will be discussed. It includes an identification of nanomaterials using their electrochemical dissolution [4] or conversion as well as a comprehensive investigation of initial stage of electrochemical nucleation [5]. In the latter case it provides a non-intrusive monitoring of formation and grow of each single nano-nucleus independently on the macroscopic electrode surface. It gives growth kinetics of each nucleus independently, time dependence of their surface density and their mutual localization. The current transients, calculated from the analysis of optical data, correspond quantitatively to the independently measured experimental current-time dependences and allow one to distinguish diffusion and reaction limited growth kinetics for each individual nucleus and time moment.

References

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Figures

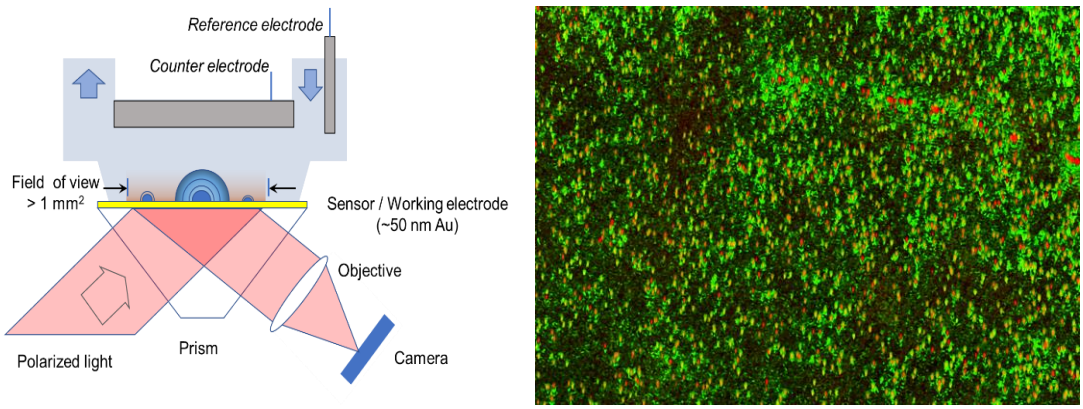

Figure 1: Schematic view of wide field surface plasmon microscopy setup (left) and the map of the nuclei growth (right) where the time of nuclei appearance is indicated by shades of green and the average growth rate is indicated by the shades of red.