SURFACE PLASMON MICROSCOPY AS A TOOL FOR MEASUREMENTS OF NANOPARTICLE CONCENTRATIONS AND INVESTIGATION OF BINDING PROCESSES

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Abstract

The development of nanotechnology needs novel methods for characterization and quantification of nanoparticles (NPs). It has been recently demonstrated that the surface plasmon microscopy (SPM) [1] provides a possibility for visualization the binding of individual NP to the surface of a gold sensor. This offers a powerful tool to study particle properties and processes of particle-surface interactions. In the present work, an analytical model of particle transfer to the sensor surface is validated by SPM.

The SPM sensor consists of a gold layer deposited on a glass prism. The gold layer is illuminated by a laser light in order to excite surface plasmons. Due to interactions of NPs with surface plasmons the light is radiated. This radiation is detected by a CCD or CMOS camera. Any nano-particle binding event emerges as a bright spot with surrounding fringes on processed images. Assuming that a particle sticks irreversibly to the sensor surface, the model allows estimation of the particle concentration without calibration. The measured dependency of the binding rate on the flow velocity is in a good agreement with the theory. If the binding rate is smaller than predicted by theory this indicates that the sticking coefficient is less than 100 %. This fact can be used for the characterization of particle-surface interactions under various conditions.

Keywords: Nanoparticles, surface plasmon microscopy

REFERENCES

[1] A.Zybin et al. Real-time Detection of Single Immobilized Nanoparticles by Surface Plasmon Resonance Imaging. Plasmonics (2010), V.5, pp.31-35

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