Title: Structuring of plasma polymers: new methods for fabrication of nano-architectured thin films

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Abstract: The PhD thesis aims at the investigation of nanostructures based on plasma polymers. The main attention is paid to the combination of a gas aggregation cluster source with plasma-assisted vapor phase deposition for the fabrication of metal-polymer nanocomposites with bactericidal potential. Copper nanoparticles were incorporated into a biocompatible matrix of plasma polymerized poly(ethylene oxide) (ppPEO). The efficiency of such nanocomposite against multi-drug resistant bacteria was demonstrated. It was found that the segmental dynamics of the plasma polymer significantly changed in the presence of nanoparticles as revealed by the measurements of the dynamic glass transition temperature. The nanoscale confinement crucially influences the non-fouling properties of poly(ethylene oxide). A separate chapter is dedicated to the examination of the nanoparticle formation, growth and transport inside the source. Copper and silver nanoparticles were detected *in situ* in the gas phase by small angle X-ray scattering and UV-Vis spectroscopy. The effect of trapping of metal nanoparticles in the plasma was discovered. Moreover, a partial loss of nanoparticles on the target and on the chamber walls was confirmed.

The last chapter of the thesis describes the applicability of our approach for the decoration of polymer nanostructures (e.g. nanoislands) by metal nanoparticles.

Keywords: nanostructure, gas aggregation cluster source, plasma polymer, nanocomposite, segmental dynamics.