Abstract

Increasing interest in industrial and medical applications of carbon nanomaterial leads to the need to examine its interactions with living systems. Nanocrystalline diamond (NCD) films possess high mechanical and chemical stability which, together with its biocompatibility with human cells, enables applications in human body. Some of carbon nanoparticles possess strong antibacterial activity.

In this work the effects of NCD with hydrogen, oxygen and fluorine termination deposited on glass and silicone on adhesion of gram-negative bacteria *Escherichia coli* K-12 in mineral medium is described and the impact of cultivation medium on effects of NCD films is compared. Prior the growth of the *E. coli* biofilm on NCD films, the method for quantification of biofilm using crystal violet staining and the method for biofilm cultivation in mineral medium were optimised. The properties of NCD film are independent on the base substrate. Hydrogen and fluorine terminated NCD films show antiadhesive properties only in mineral medium but not in complex medium. This is explained by formation of a conditioning film on the surface of the NCD film during cultivation in complex medium. On the other hand, O-NCD film supports bacterial adhesion in both cultivation media.

Second part of this thesis is dedicated to carbon nanoparticles with potential antibacterial properties, nanodiamond, carbon nanotubes and reduced GrapheneOxide, against *E. coli* and *Staphylococcus epidermidis*.

Key words: Nanocrystalline diamond, carbon nanotubes, reduced graphene oxide, diamond nanoparticles, biofilm, *Escherichia coli, Staphylococcus epidermidis*