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Modified SiO_2 coatings with increased resistance to microbial colonization obtained by sol-gel technology

Abstract

Colonization of surfaces of different materials by bacteria can be a source of infection, as well as an obstacle for the proper functioning of some of the biomedical equipment. Bacterial biofilm makes decline the quality and functionality of materials, the deterioration of their physical - chemical parameters and structural modification. It is essential to develop the protection against the microbial colonization. The increase in resistance to bacterial colonization can be achieved by antimicrobial coatings with appropriate level of hydrophobicity.

Thus, the objective of the doctoral dissertation is to investigate the effect of surface wettability and the amount of additives with antibacterial properties (Zn) on the ability of bacteria to colonize coatings that are based on SiO_2.

After reviewing the literature and conducting a preliminary study it was concluded that: "It is possible to produce a sol-gel coatings based on SiO_2 possessing an increased resistance to microbial colonization."

As the precursor of sols tetraethoxysilan (TEOS) was used. The properties of sols were modified using additives of methyltrimethoxysilan (MTMS), hexamethyldisilazane (HMDS), zinc nitrate and zinc acetate.

The coatings were characterized using by research of thickness, surface morphology, roughness, chemical structure and hydrophobicity. Antibacterial properties of coatings were determined by examining of their susceptibility to colonization by the bacteria *Escherichia coli.*

It was found that the addition of zinc reduces the risk of bacterial colonization and hydrophobicity is not essential to the level of *E. coli* colonization.

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