

## Abstract

Dissertation thesis entitled „Characteristics of the physicochemical properties of titanium-doped diamond-like carbon coatings and their modification with thin organic layers” presents the studies of wettability, friction, wear, stability in various environmental conditions and antimicrobial activity of titanium-doped DLC coatings before and after modification by phosphonic acids. The self-assembled monolayers on Ti-DLC coatings were obtained using the liquid phase deposition method, and the modifiers used for deposition had a different chemical structure. In this dissertation, the influence of titanium content in the DLC coating as well as the impact of the structure of selected phosphonic acids on the studied physicochemical parameters was determined.

In the first part of the work, there is justification for taking up the topic and an analysis of the current state of knowledge about amorphous carbon structures and the available methods of modifying DLC coatings in order to extend their application possibilities was presented. The first chapter was focused on the physicochemical and mechanical properties of DLC carbon structures and discusses the main problems that limit their application. In the next two chapters, methods of direct and indirect modification were presented and described, which make it possible to eliminate the drawbacks limiting the application possibilities of DLC coatings. When analyzing direct modification, much attention was paid to discussing the influence of the type of admixture used in the DLC coating on its physicochemical and mechanical properties. However, in the case of indirect modification, the most common used chemical compounds were characterized, such as: thiols, organosilicon compounds, carboxylic acids or phosphonic acids involved in the formation of the SAM layer, and the benefits of its presence were presented.

The second part of the dissertation consists of own research along with the presented aim, thesis and scope of the work. This section describes also the measurement techniques used in the analysis of the structure, morphology and physicochemical properties of both doped carbon coatings and the produced coating-layer systems. Chapter 6 presented the preparation of Ti-DLC coatings with various titanium contents and determined their percentage composition and morphology using selected spectroscopic and microscopic techniques. The following chapters contain

information on the formation of self-assembled layers of phosphonic acids by liquid phase deposition method on Ti-DLC coatings, and the characteristics of their physicochemical properties, such as: wettability, friction in nano-, micro- and macroscale, wear, stability in various environmental conditions and antimicrobial activity. In these chapters the influence of the structure of the phosphonic acid used for deposition, as well as the titanium content in the DLC coating on the studied properties was determined. All the obtained research results were collected and summarized in the next part of the work. At the end, the bibliography and scientific achievements also were posted.