The influence of surface preparation on the corrosion and mechanical properties of Ti6Al4V titanium alloy

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The physical, chemical and mechanical properties of titanium alloys make this materials an appropriate candidate for a variety of technical applications. The highest strength to weight ratio of all metals up to 600°C and an excellent resistance against wet corrosion due to spontaneous formation of a passivating oxide layer have introduced titanium components into the fields of chemical, aerospace and biomedicine engineering. The oxides layers are barrier between the surrounding environment and the underlying metallic titanium. Nevertheless, in all materials the passive layer can be mechanically damaged and also in the presence of aggressive anion species, especially fluoride ions F^-, oxides layer is not sustainable. This leads to a significant reduction in corrosion resistance of titanium alloy.

Various surface modification technologies have been proposed and investigated with a view to improving the corrosion and mechanical properties of titanium alloys, including anodizing, laser alloying, coating techniques, heat treating processes and ion implantation processes. However, the continued search for new methods of surface modification of titanium alloys to improve their mechanical parameters and corrosion resistance is under way. These methods include also plasma technologies i.e.: the plasma enhanced chemical vapour deposition process (PECVD) and magnetron sputtering process preparation of thin dielectric layers are growing in popularity. However, before any process of coatings manufacturing, it is appropriate to surface preparation of metal alloy.

The paper focuses on the comparative studies of corrosion and mechanical properties of Ti6Al4V titanium alloy after surface preparation by different methods: mechanical polishing and electrochemical polishing, and influence on the corrosion properties of nanocoatings.

The tests were done by means of voltametric measurements in a fluoride solution. Surfaces of the titanium alloy was characterized using atomic force microscope, nanoindentation measurements and scanning electron microscope.

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