Tribology analysis on anodized aluminum surfaces for biomedical purposes

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Contextualização: Biomaterials surfaces need to be adequate to the function they perform; for this reason, the importance of studying surface finish increases as design requirements grow, regarding geometry and precision requirements in biomedical devices. These biomaterials are subject to several types of premature failure, such as wear, fatigue, micro movements, particle detachment and degradation, which may generate the need for new interventions. Anodizing is an electrolytic passivation process used to increase the thickness of the natural oxide layer on the surface of metal parts. Due to good biocompatibility, regular arrangement of nanopores, ease of control of nanopore diameter, large specific surface area, low cost, good thermal stability and absence of toxicity, anodic aluminum oxide has been studied. The geometric arrangement of nanopores makes it possible to use alumina as a mold for the synthesis of several nanostructures that have many advantages in advanced application areas due to their unique chemical, physical, mechanical, and optical properties. **Objetivo:** Evaluate the tribological behavior of anodized aluminum alloys samples. **Material e métodos: T**he tribological behavior of samples of aluminum alloy AA6061 anodized in oxalic acid solution ($C_2H_2O_4$) and sulfuric acid (H_2SO_4) at three immersion times: 1 h, 2 h, and 4 h was evaluated. Prior to the anodization stage, the samples were electrolytically polished in a solution of perchloric acid and ethanol. For comparison reasons, pristine surfaces were also evaluated. Atomic force microscopy was also used to evaluate samples roughness and topography. The wear tests were carried out during 10 min, solid spheres of 52-100 chrome steel, with 2 mm in diameter, were used as counter-bodies. **Resultados:** There is a tendency towards an increase in friction force values according to the use of the surface anodizing treatment of aluminum AA6061. Only the sample anodized in sulfuric acid for 1 hour of immersion showed a slight drop in this value, in relation to the standard reference sample, as shown in Figure 1. **Conclusões:** The results indicated that the tribological behavior is influenced by the anodized layer process parameters, and the wear rate is dependent of the normal force and the roughness of each sample. Therefore, it is necessary to constantly advance research on the use of nanoporous anodic alumina coatings on the surfaces of biomaterials.

Referências bibliográficas:

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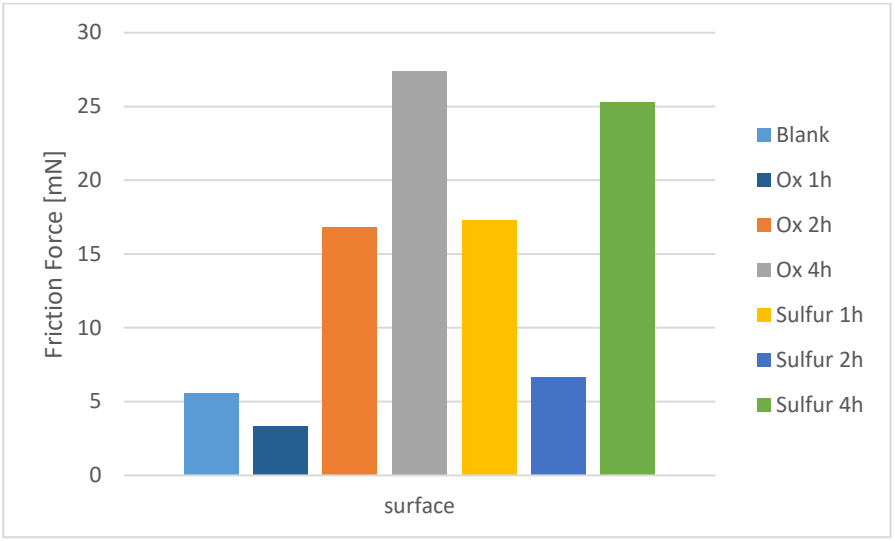

Figure 1. Friction force for each type of surface finishing comparing to the blank surface (without treatment).