Tribological evaluation of anodized aluminum applied to biomaterials

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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. In the present work, the tribological behavior of samples of aluminum alloy AA6061 anodized in oxalic acid solution (C2H2O4) and sulfuric acid (H2SO4) 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. The sample's surfaces finishing was analyzed by laser confocal microscopy. 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. 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. Acknowledgments: The authors would like to thank CNPq for the financial support.