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WEAR PROPERTIES OF Ti-6Al-4V ALLOY AFTER PLASMA NITRIDING TREATMENT

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Ti-6Al-4V alloy is one of the most used titanium alloys in aeronautical industries and biomedical applications due to its excellent combination of mechanical resistance, toughness and excellent corrosion resistance, and biocompatibility, however with low wear resistance, with high friction coefficient of around 0.8. This work aims to improve these characteristics by PN (Plasma Nitriding) process. The samples were treated at 750° C, during 2 hours and tested by pin-on-disc method. The coefficient of friction decreased of 0.8 to around 0.2 and the measured of the wear scars, analyzed by SEM (Scanning Electron Microscope), are 730 µm and 70 µm, to untreated sample and treated by NP, respectively. The nitrogen profiles were measured by GDOES (Glow Discharge Optical Emission Spectroscopy). The thickness of nitrogen layer reached around 1 µm, but the nitrogen can still be found in depths of up to 2 µm. For medical applications, it has to be noticed that no more aluminum and vanadium are present in the surface layer. The improvement of surface properties could also be confirmed by the nanoindentation technique, with values of hardness increasing around 170%, when compared with the untreated samples. The specimens will be analyzed by XRD (X-ray diffraction), to confirm the presence of titanium nitride. This results confirm the improvement of mechanical properties of surface and the wear resistance of these alloy by PN, as expected for many applications.