Roughness and creep studies of Ti-6Al-4V alloy treated by Nitrogen Plasma Based Ion Implantation

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Abstract

The search for alloys with improved high-temperature specific strength and creep-resistance properties for aerospace applications has led in the last decades to sustained research activities to develop new alloys and/or improve existing ones. Titanium and its alloys are excellent for applications in structural components submitted to high temperatures owing to their high strength to weight ratio, good corrosion resistance and metallurgical stability. Its high creep resistance is of great importance in enhancing engine performance. However, the affinity by oxygen is one of main factors that limit its application as structural material at high temperatures. Materials with adequate behavior at high temperatures and aggressive environmental became a scientific requirement, technological and economically nowadays. The objective of this work is the roughness and creep studies of the Ti-6Al-4V alloy after treatment by nitrogen Plasma Immersion Ion Implantation (PIII) process. The aim of this process is the improvement of superficial mechanical properties of the Ti-6Al-4V alloy. The selected alloy after ionic implantation process by plasma immersion was submitted to creep tests in 600 °C, in constant load mode at 250 and 319 MPa. The techniques used in this work were Auger, AFM, X ray, Raman and creep test. The results show the significant increase of material resistance, it can be used as protection of oxidation in high temperatures applications.

Keywords: Ti6Al4V, creep, Plasma Based Ion Implantation, roughness

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