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Improved properties of Ti6Al4V by means of nitrogen-hydrogen high temperature plasma based ion implantation

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A stable heating source, able to provide steady temperatures in the range of 200 to more than 1000 ^{0}C, was used to perform high temperature plasma based ion implantation (PBII) on Ti6Al4V. The precise control of the heating of the samples in vacuum and in the presence of the nitrogen plasma is accomplished by means of efficient electron source, working independently of the conditions of the discharge. The electrons produced by a low work function (1.5 eV) barium oxide cathode help with the start-up of the discharge, with the increase of nitrogen ionization and heating of the samples. Inherent growth of the treated layer thickness provided by the thermal diffusion of nitrogen ions was increased due to the presence of hydrogen. It helps with the removal of oxygen from the surface of the alloy reinforcing the penetration of the nitrogen in direction to the bulk of the material. Experiments were run by varying substrate temperature during PBII from 600 to 800 ^{0}C and the partial pressure of hydrogen. A strict comparison was performed concerning mechanical and tribological properties, besides corrosion resistance.

Keywords
ion implantation
high temperature
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