11th International Conference on Advanced Materials
Rio de Janeiro Brazil
September 20 - 25
ICAM2009

Nitrogen Plasma Immersion Ion Implantation (PIII) of nickel titanium shape memory alloy

S.C. Baldissera[(1)], M. Ueda[(1)], J. Otubo[(2)], L.K. Kabayama[(2)]*

(1) Laboratório Associado de Plasma (LAP), Instituo Nacional de Pesquisas Espaciais, CP 515, 12201-970, São José dos Campos, S.P., Brasil, email: skabayama@plasma.inpe.br
(2) Instituto Tecnológico de Aeronáutica – ITA, São José dos Campos – SP, Brasil
* Corresponding author.

Abstract – Nickel Titanium (NiTi) is a shape memory alloy is a unique material showing the shape memory effect and superelastic property that are attractive to biomedical applications. However nickel is an allergy compound and its liberation inside human body must be controlled with a NiTi alloys surface modification by nitrogen plasma immersion ion implantation (PIII), which implants a TiN layer on the substrate surface, enhancing the alloys surface corrosion resistance. This work presents the influence of NiTi alloys surface modification by nitrogen plasma immersion ion implantation (PIII) on its corrosion resistance.

The plasma immersion ion implantation (PIII) was applied in the thermally treated NiTi alloy and this nitrogen layer thickness in the sample surface can vary according the electrical tension variation. The condition of PIII for the samples of NiTi for the present experiments were typically: 10 kV (T1) and 16 kV (T2) peak voltage, 400 Hz frequency, 40 μs pulse duration, total processing time of 2h, using nitrogen with p = $3{,}5x10^{-5}$ mbar.

The potentiodynamic polarization tests were performed by scanning the applied potential from -1000 $mV_{Ag/AgCl}$ and moved in the anodic direction to 1000 $mV_{Ag/AgCl}$ at a scan rate of $1mVs^{-1}$ in 0.9 %wt NaCl aqueous solution, pH 6.0, at room temperature (~25 ^{o}C). The Figure 1 shows potentiodynamic curves samples thermally treated and standard. The density current of corrosion in implanted samples is smaller than to standard indicating a higher corrosion resistance of these surfaces. This behavior is due to nitrogen rich layer on 3IP surface treated.

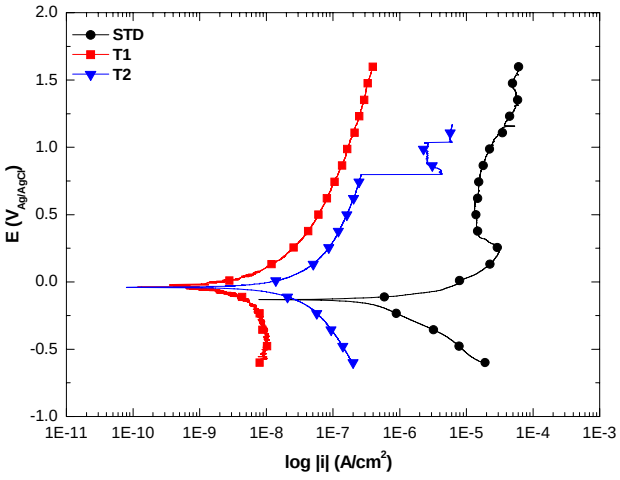

Figure 1: Potentiodynamic curves of the NiTi alloy after nitrogen plasma immersion ion in NaCl 0,9% solution at temperature room and pH 6.0

[1] S. Mändl, Surface & Coatings Technology, 201 (2007) 6833-6838
[2] Y. Oshida Corrosion Engineering, 40 (1991) 1009-1025