

## CORROSION RESISTANCE OF AERONAUTICS ALLOYS TREATED BY PLASMA IMMERSION ION IMPLANTATION (PIII)

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**Abstract** – To increase the corrosion resistance of Al7075-T7351 and Ti-6Al-4V alloys were performed treatments by PIII. Experiments were made by using a mixture of N<sub>2</sub> and H<sub>2</sub> at ratio of 1:1. The time of treatment varied between one and three hours to verify its influence on the electrochemical behavior of these materials. After implantation process the samples of the aluminum and titanium alloys showed improved corrosion resistance. The better result was obtained to Al7075 alloy, due its smaller corrosion current density presented at polarization tests.

The surface treatments had been used to improve the performance of materials in many types of industry such as aeronautics. Plasma immersion ion implantation (PIII) is a technique that allows the treatment of several industrial pieces with complex geometries. Because during this treatment the samples are quite immersed in plasma [1-4].

The aluminum and titanium alloys, Al7075-T7351 and Ti-6Al-4V respectively, were treated by nitrogen PIII to increase their corrosion resistance. Experiments were made by using a mixture of N<sub>2</sub> and H<sub>2</sub> at ratio of 1:1. The time of treatment varied between one and three hours to verify its influence on the electrochemical behavior of these materials. For the characterization of surfaces were made X ray diffraction and Auger spectroscopy. The corrosion resistance was evaluated by anodic potentiodynamic polarization and electrochemical impedance spectroscopy. All corrosion tests were performed at room temperature in 3.5 wt. % NaCl medium naturally aerated, the morphology of the samples after these tests was evaluated by SEM.

Samples of the Al7075 alloy treated at 1 and 2 h showed corrosion current densities of one hundred times smaller indicating a greater resistance to corrosion of these surfaces, as can to be seen on Figure 1. The alloy Ti-6Al-4V showed a decrease in the values of passive current density of one order of magnitude (Figure 2). The best result was obtained for the aluminum alloy Al7075 treated for one hour. The titanium alloy was also improved their resistance to corrosion, but to a lesser extent than aluminum alloy. This better performance of the material treated by PIII is the layer enriched with nitrogen verified by Auger profile.

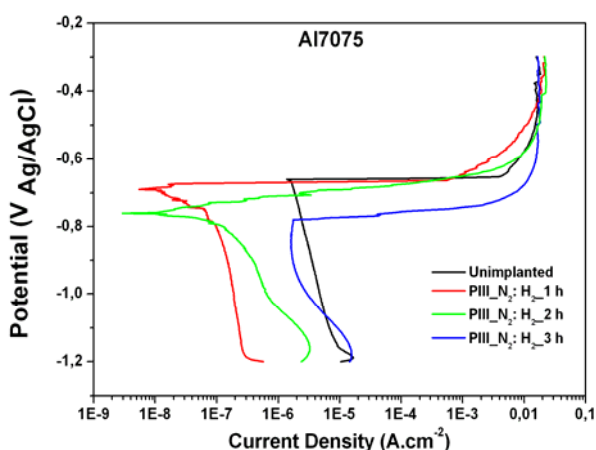


Figure 1: Polarization curves of the Al7075 alloy before and after PIII.

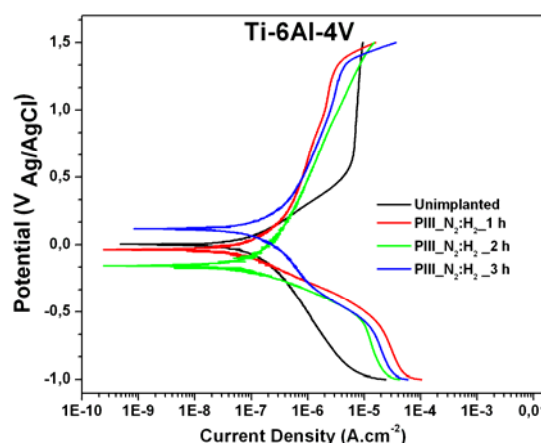


Figure 2: Polarization curves of the Ti-6Al-4V alloy before and after PIII.

### References

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