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**Duplex Surface Treatment Combining Plasma Nitriding and TiN-PVD Coating for Austenitic Stainless Steel AISI 316L**Carlos Eduardo Pinedo<sup>1</sup>, Gabriela Bruno Tieppo<sup>2</sup>, Mario Boccalini Jr<sup>3</sup>

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In this paper a combined plasma nitriding and TiN-PVD coating is presented as a surface treatment suitable to increase tribological properties of 316L SS. For coating 316L ASS it is very important to consider the strong difference on mechanical properties of this substrate and the hard coating, decreasing coating adhesion and promoting delamination. Increase on substrate mechanical properties by nitriding can be a solution to increase coating adhesion. Plasma nitriding were carried out at high (550°C) and low (380°C) temperatures in order to obtain different microstructures on surface to be used as support for the post TiN hard coating. Surfaces structures were characterized by microscopy and X-ray diffraction. Mechanical properties were evaluated by microhardness and deep-sensing indentation. Nitriding is able to increase surface hardness to values higher than 12 GPa independently of the nitriding temperature and maintain Elastic Modulus close to 250 GPa. For the TiN it was measured a hardness of 22 GPa and Elastic Modulus of 440 GPa. Considering the need to have close mechanical properties on nitrified case/TiN interface in order to increase adhesion properties, nitriding is effective to increase the relation H/E of the 316L substrate close to that of the TiN coating, up to 0,05. Adhesion, measured by Rockwell indentation and micro-scratch showed best performance for the condition of low temperature plasma nitrided compared to the high temperature plasma nitrided and the un-nitrided state. It is pointed out that not only H/E is an important parameter for adhesion, but nitrided surface toughness, a microstructure sensitive property, must be considered.

**Keywords**

plasma nitriding  
pvd  
duplex process  
TiN  
adhesion