

# DEPOSITION OF TiN FILM ON CARBON STEEL BANDSAW BLADES BY THE COLD PLASMA TECHNIQUE.

T. A. M. Lima<sup>1</sup>, G.G. Lima<sup>2</sup>, W. L. E. Magalhães<sup>3</sup>, N. K. Kuromoto<sup>4</sup>

<sup>1</sup>*Graduate Program in Engineering and Materials Science, Federal University of Parana, Curitiba, PR, Brazil*

<sup>2</sup>*Graduate Program in Mechanical Engineering, Federal University of Parana, Curitiba, PR, Brazil*

<sup>3</sup>*Brazilian Agricultural Research Corporation, Colombo, PR, Brazil*

<sup>4</sup>*Department of Physics, Federal University of Parana, Curitiba, PR, Brazil*

The deposition of a coating on tools could bring a series of benefits, like surface hardening, increased durability, lower maintenance costs and increase productivity. These factors have conducted a study in the area of coatings, mainly related to the polymer coating [1]. This work studied the deposition of TiN films by using the technique of cold plasma and by using precursors, such as titanium tetraisopropoxide gases and nitrogen gas, with the aim of hardening saws tapes to obtain better yields and quality of sawing lumber in the primary. Carbon steel saws tapes 1030 were used as the main materials. The samples were prepared by varying the nitrogen flow at 20sccm, 15sccm and 5sccm. Moreover, for the samples ranged from 5sccm, the reaction time in plasma ranged between 2 hours and 4 hours. TiN films were also deposited using an industrial process (Physical Vapour Deposition - PVD) in order to compare with the samples obtained by the technique of cold plasma. The morphology of the coating was characterized by scanning electron microscopy (SEM), structural changes with X-ray diffraction (XRD), tribological characterization using a reciprocating tribometer, hardness values using instrumented indentation. The SEM images showed that the original surface is covered with a new layer and XRD showed the presence of the phases of TiN. These results showed that the coating process occurred in the samples effectively. The tribological characterization was carried out on the original surface and on the coating surface. The coefficient of friction values obtained on the TiN coatings decreased when compared with the original bandsaw blades surface indicating a significant improvement: due to increased wear resistance compared to original surface. The hardness values increased with the cold plasma and PVD treatment. So, the preliminary results show an uniform TiN film deposited on the substrate with lower coefficient of friction and increased hardness indicating that the cold plasma technique produce a better surface than the commercial carbon steels saws tapes.

Keywords: cold plasma, deposition, bandsaw blades.

[1] C. A. Júnior. Nitretação a plasma: fundamentos e aplicações. Natal, Brasil, 2001.

*E-mail: tieli.lima@gmail.com, Graduate Program in Engineering and Materials Science, Federal University of Parana, Post office box : 19011 – Curitiba, Brasil.*