TRIBOLOGICAL CHARACTERIZATION OF CARBON STEEL BAND SAW BLADES FOR WOOD CUTTING BY THE COLD PLASMA TECHNIQUE

T. Lima[1], G.Lima[2], W. Magalhães[3], N. Kuromoto[4]
[1]Programa de Pós-Graduação em Engenharia e Ciência dos Materiais, Universidade Federal do Paraná, Caixa Postal: 19011 – Curitiba, Brasil, [2]Programa de Pós Graduação em Engenharia Mecânica, Caixa postal 19011, Curitiba, Brasil, [3]Empresa Brasileira de Pesquisa Agropecuária, Estrada da Ribeira, km 111, Curitiba, Brasil, [4]Departamento de Física, Universidade Federal do Paraná, Centro Politécnico, Caixa Postal 19044, Curitiba,Brasil, E-mail:tieli.lima@gmail.com, gabriel.goetten@gmail.com, wmagalha@cnpf.embrapa.br, kuromoto@fisica.ufpr.br.

The search for materials that are resistant to aggressive media and have long shelf life has been of great interest recently. This factor has conducted a study in the area of coatings, mainly related to the polymer coating [1]. These coatings have been successfully used for the enhancement of tribological properties in terms of reduced friction and increased wear resistance and corrosion even in cutting tools, besides being a new alternative for extending the useful life of these materials [2]. In general, during the process of sawing, the saw blade tape loses efficiency of about 20 hours of operation. Based on this, 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. The morphology of the coating was characterized by scanning electron microscopy (SEM), structural changes with X-ray diffraction (XRD) and tribological characterization using a reciprocating tribometer. It was used against the sample a sphere of tungsten carbide under the load of 1N. The sliding velocity was 5 cm/s with half width from 3 mm and 5000 laps. 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.

[1] C. A. Júnior. Nitretação a plasma: fundamentos e aplicações. Natal,Brasil, 2001.
[2] P. Beer, J. Rudnicki, L. Ciupinski, M.A. Djouadi, C. Nouveau. Modification by composite coatings of knives made of low alloy steel for wood machining purposes. Surface and Coating Technology. n. 174/175, p. 434-439, 2003.