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**Investigation of Plasma Nitriding Process by Absorption Spectroscopy**Vladimir Scheid<sup>1</sup>, Davi Neves<sup>2</sup><sup>1</sup>Dept. of Aerospace Science and Technol, sao jose dos campos, Brazil <sup>2</sup>Dept. of Aerospace Science and Technol., sao jose dos campos, Brazil

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In this work the glow discharge of a plasma nitriding process was investigated using absorption spectroscopy. A small hollow cathode running inside the nitriding chamber was used as line light source in the absorption measurements. Density profiles of sputtered iron atoms were measured in the cathode fall and negative glow. In addition, the emission signals of the gas species were also monitored. The cleaning discharge, conducted in an Ar/H<sub>2</sub> atmosphere prior to nitriding, was also investigated. Samples of mild steel AISI 1020 and low alloy steel AISI 4340 were used as substrates for characterization of the treatments. They were nitrided at temperatures varying from 723 K up to 823 K for 1 h in N<sub>2</sub>/H<sub>2</sub> atmospheres with different nitrogen contents. The treated surfaces were analyzed with respect to their composition, microstructure, crystallographic structure, surface roughness and Vickers microhardness. After Nitriding, a typical surface hardness of 430 HV<sub>0,1</sub> and 820 HV<sub>0,1</sub> was measured for the 1020 and 4340 steel, respectively. A hardness decrease was observed due to decarburization in the cleaning discharge for temperatures above 700 K. A correlation between the spectroscopic measurements, the process parameters and the surface properties at different stages of the process will be presented and analyzed.

**Keywords**

Absorption spectroscopy  
emission spectroscopy  
plasma nitriding