

OR2001

**Plasma-assisted duplex treatment of AISI 316LM steel: surface micro-structuration by ion beam etching following by a nitriding process. Influence of treatment parameters on tribological properties.**

Anastasiia Pavlik<sup>1</sup>, Andrea Cappella<sup>2</sup>, Mamadou Coulibaly<sup>2</sup>, Sylvain Philippon<sup>3</sup>, Thierry Grosdidier<sup>2</sup>, Gregory Marcos<sup>4</sup>, Thierry Czerwiec<sup>4</sup>

<sup>1</sup>Institute Jean Lamour/LEM3, Nancy, France <sup>2</sup>LEM3, Metz, France <sup>3</sup>Metz, Metz, France <sup>4</sup>Institut Jean Lamour, Nancy, France

anastasiia.pavlik@univ-lorraine.fr

The enhancement of the tribological properties of stainless-steels is a major industrial challenge. This kind of material shows a high mechanical resistance, a low thermal conductivity, a good corrosion resistance if exposed to cold and humid atmosphere, and could be easily recycled. Two techniques are generally used to functionalize stainless steel surfaces without affecting its corrosion resistance: the surface structuration and the plasma-assisted thermochemical treatment. The former technique is commonly used to reduce cinematic friction coefficient whereas the latest is addressed to improve the hardness of the surface. In this study both surface treatments were combined to functionalize an AISI 316 LM austenitic stainless steel. To implement this duplex treatment, we performed an ion beam etching in Ar/H<sub>2</sub> plasma using special masks of different dimensions followed by a nitriding process performed in an ECR reactor at 400°C. A parametric study of the duplex treatment was performed to characterize the role of mask geometry on the nitrated layer properties. The influence of the duplex treatment and the role of spacing between asperities as well as their roughness were identified by using a "Ball-on-plate" tribometer.

[1] Borghi, Aa, et al. "Tribological effects of surface texturing on nitriding steel for high-performance engine applications." *Wear* 265.7 (2008)

[2] Bell, T. "Surface engineering of austenitic stainless steel." *Surface Eng.* 18.6 (2002): 415-422.

[3] A. Lacoste, T. Lagarde, S. Bechu, Y. Arnal and J. Pelletier, *Plasma Sources Sci. Technol.* 11, 2002

**Keywords**

nitriding

ion beam etching

structuration

stainless steel

wear