



## INTERNATIONAL WORKSHOP ADVANCES IN CLEANER PRODUCTION

"KEY ELEMENTS FOR A SUSTAINABLE WORLD: ENERGY, WATER AND CLIMATE CHANGE"

# Plasma Processes as a Cleaner Alternative for Cleaning, Corrosion Resistance, and Functionalization of Metallic Surfaces

T. García, E. Nascimento, E. Bittencourt

*Departamento de Tecnologia de Polimeros, FEQ, UNICAMP Av Albert  
Einstein, 500, CEP, 13083-970, Campinas, SP, BRAZIL,  
[e\\_bittencourt@uol.com.br](mailto:e_bittencourt@uol.com.br)*

---

### Abstract

The development of clean and efficient high vacuum technologies to replace traditional methods for metallic or polymeric surfaces treatments to clean, deposit thin films, and functionalize surfaces, constitutes a very important area of research. The increasing concern regarding the development of environmentally friendly and sustainable technologies consists in an important objective in the modern world. In this context, cold plasma technology represents an efficient alternative, which has been object of increasing attention. In this work we evaluate the effect of plasma treatments on the removal of oil from aluminum surfaces. Furthermore, processes of deposition, and fine film activation, were studied on the surface previously cleaned. After a first plasma application to clean the oil contaminated aluminum surface, a thin film of HMDSO was deposited to achieve corrosion protection, and finally the deposited film was functionalized to obtain a surface with a higher energy, to favor adhesion to different polymers. The evaluation of the cleanness efficiency was conducted by means of the contact angle, and XPS. The nature of deposited and functionalized film was investigated using Fourier Transform Infra Red Spectroscopy (FTIR), angle of contact, and Scanning Electron Microscopy. A very significant reduction in the carbon content of the surfaces, was observed. An increase in the surface energy of 95,48 mN/m was obtained. Cleaning, corrosion protection and functionalization utilizing high vacuum technology can completely substitute wet processes associated with undesirable high environmental impact. In the presentation other works developed by the research groups will be discussed.

*Keywords: Plasma, cleaning, surface modification, hexamethyldisiloxane.*

---