
Surface modification of materials by cold atmospheric plasma (Invited talk)

Konstantin G. Kostov*^{†1}, Thalita M. C. Nishime¹, Luiz R. O. Hein¹, Alonso H. R. Castro¹, Andras Toth², and Munemasa Machida³

¹Universidade Estadual Paulista (UNESP) – Av. Dr. Ariberto Pereira da Cunha, 333 Guaratiguetá, 12516-410, SP, Brazil, Brazil

²Institute of Material and Environmental Chemistry, Hungarian Academy of Science (RCNS HAS) – P.O. Box 17, H-1525, Budapest, Hungary

³Instituto de Física, Universidade de Campinas (UNICAMP) – 777, Segio Buarque de Holanda Str., Campinas, 13083-859, SP, Brazil

Abstract

Due to their favorable mechanical characteristics, lightweight and easy recycling polymeric materials are widely utilized in car, marine and aerospace industry. However, the application of polymers in some fields like packing, coating and biomedical applications is limited because of their low surface energy and poor adhesion properties. Different methods, such as wet-chemical treatment, ion beams and electrical discharges are employed to enhance the surface wettability of materials. Atmospheric pressure plasmas, such as corona, dielectric barrier discharge (DBD) and cold atmospheric pressure plasma jet (APPJ), have been intensively used in an increasing number of industrial and biomedical applications because they are environmentally friendly, require low capital cost and can be easily scaled-up and implemented in a continuous production line processing. Recently, plasma jets generated at atmospheric pressure have demonstrated a rapid development and great application promise in surface treatment and sterilization. In this presentation a brief review of cold atmospheric plasma jets, their configurations, characteristics, modes of operation, and applications will be given. Also, we will report the surface modification of different engineering polymers, such as polyethylene, polypropylene e PET, by an APPJ operating with Ar gas. The aims of this study are to determine the optimal treatment conditions and also to compare the degree of surface modification by plasma jet with results obtained by another surface modification technique at atmospheric – the dielectric barrier discharge (DBD). The advantages and the disadvantages of the cold atmospheric plasma jets for material surface modification are discussed.

Keywords: Atmospheric plasma, cold plasma jet, surface modification

*Speaker

[†]Corresponding author: kostov@feg.unesp.br