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Cold Plasma processes for Surface Modification of Materials

Charafeddine JAMA

Univ. Lille, CNRS, INRAE, Centrale Lille, UMR 8207 – UMET Unité Matériaux et Transformations, F-59000 Lille, France

Abstract

Multifunctional effects are essential for producing higher value added materials, important not only for new technical applications but also for more traditional uses. The growing environmental and energy-saving concerns will also lead to the gradual replacement of many traditional wet chemistry-based processing, using large amounts of water, energy and effluents, by various forms of low-liquor and dry-finishing processes. The dominant role of plasma-treated surfaces in key industrial sectors, such as microelectronics is well known, and plasmas are being used to modify a huge range of material surfaces, including plastics, polymers, papers, food packaging and biomaterials. In previous works, it was evidenced that cold plasma technologies can induce several surface modifications such as change in surface polarity, grafting of chemicals or deposition of functional coatings (Figs. 1&2). Such modifications are effective to confer new and durable properties to synthetic or natural polymers, without altering their bulk properties.

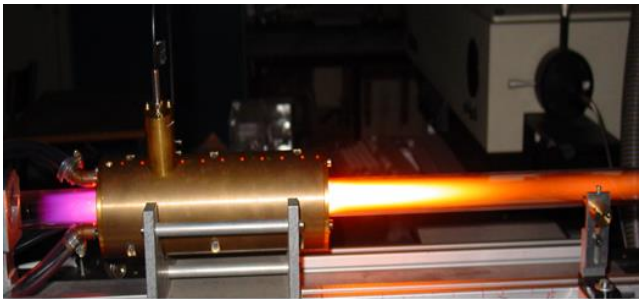

Figure 1 : Nitrogen Plasma Process

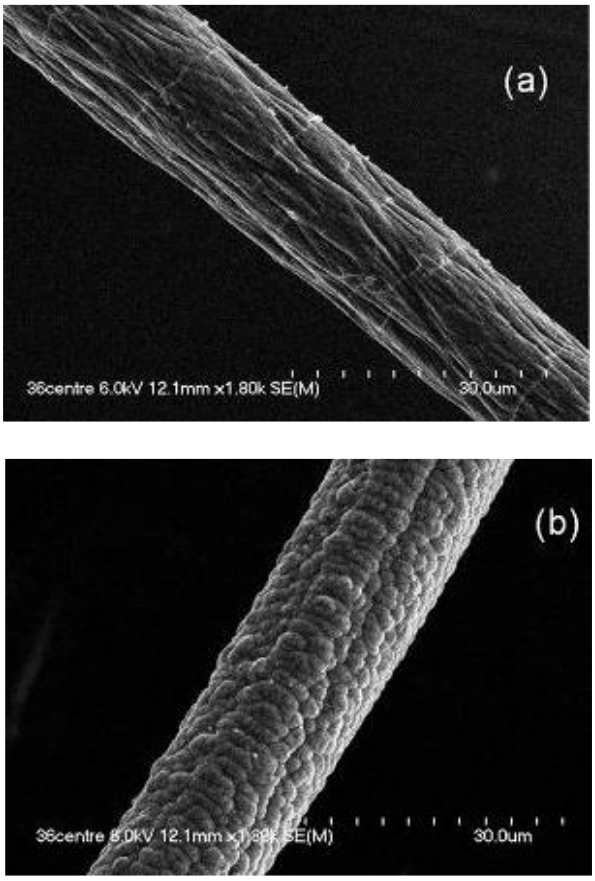

Figure 2 : Plasma deposition of organosilicon coatings: SEM images of (a) Uncoated ; (b) Coated fibers

The presentation will give a comprehensive description and review of the science and technology related to plasmas, with particular emphasis on their potential use in the industry. Examples of surface functionalization of materials achieved by means of cold plasma grafting and/or deposition of hydrophilic or hydrophobic coatings, antibacterial, anticorrosion and fire retardant materials will be presented.

Biography

Prof. Charafeddine JAMA started his research career since (1990) at the University of Science and technology of Lille and developed several industrial processes. He is author of more than 162 research papers in international journals. In 1999, he joined the UMET UMR CNRS 8207 laboratory as Professor and he is developing research on new surface modification processes for multifunctional materials, anticorrosion, antioxidant and antibacterial applications. His H-index is 39 on Scopus.

Email: charafeddine.jama@centralelille.fr