Study of atmospheric pressure radiofrequency Ar/O₂ plasma afterglow used for PTFE surface modification

CORINNE DULUARD, THIERRY DUFOUR, EMILE CARBONE, FRANÇOIS RENIERS, Université Libre de Bruxelles, Faculté des Sciences, Chimie Analytique et Chimie des Interfaces—Polytetrafluoroethylene (PTFE) is a hydrophobic polymer, the surface energy of which can be tailored by plasma treatment to increase its adhesion properties or to enhance its hydrophobicity, for example for biocompatible applications. Super-hydrophobic behavior was obtained by low pressure O₂ plasma treatment, and was attributed to surface roughening due to strong etching by O₂ plasma. Recently, an increase in hydrophobicity has also been observed after treatment in the afterglow of an atmospheric pressure radiofrequency Ar/O₂ plasma with up to 0.1% O₂ in the feed gas. To get a better understanding of the mechanisms responsible for PTFE surface modification, the Ar/O₂ plasma afterglow is characterized by spatially resolved optical emission spectroscopy and mass spectrometry. The influence of gas flow rate, power and substrate-to-electrode distance on the plasma properties is evaluated, and correlated with the change of PTFE surface energy and surface composition, determined by water contact angle measurements and X-ray photoelectron spectroscopy respectively.

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