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Modification of PMMA surface properties by treatment with an RF atmospheric pressure plasma jet in presence of water vaporsTomy Accente¹, Maximilian Teodorescu¹, Maria-Daniela Ionita¹, Gheorghe Dinescu¹¹NILPRP, Bucharest Magurele, Romania

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Modification of polymer surface properties (especially their wettability) presents interest for various practical applications (printing, dental prostheses, etc.). In the present contribution we investigated the modification of surface properties of poly(methyl methacrylate)(PMMA) using an non-thermal atmospheric pressure plasma jet generated by a discharge with bare electrode (DBE), operated at 13.56 MHz, and 15 W forwarded power. The treatments were performed remotely, by scanning the surface of polymeric foils with the plasma jet using an X-Y translation table. The discharge feeding gases used were either dry Ar or Ar in mixture with water vapors (humid Ar). Water vapors were supplied in the discharge by mixing dry Ar with Ar circulated through a bubbler containing double distilled water. Modification of plasma jet characteristics by water vapors was investigated by optical emission spectroscopy. In the case of treatment with dry Ar, the samples were exposed to plasma for different durations (by increasing the number of scans), while the treatments with humid Ar were limited to only one scan for different contents of the water vapors in the discharge. The two different types of PMMA samples (treated in dry Ar and in humid Ar) were compared in respect with their surface properties using the following techniques: contact angle measurements, atomic force microscopy, scanning electron microscopy and Fourier transform infrared spectroscopy. The results show that treatment of PMMA polymeric foils in humid Ar plasma jet (injecting an optimized amount of water vapors) leads to the increase of wettability mainly due to surface chemistry modification, while the polymer surface is only slightly deteriorated (the roughness remains similar with that of the untreated sample). Similar wettability is obtained in the case of treatment with dry plasma jet for a higher number of scans, which is accompanied by an increase of the surface roughness.

Keywordsatmospheric pressure plasma
polymer plasma treatment
water vapors in discharge
surface modification