PLASMA NANOTREATMENT OF CONVENTIONAL AND MICRO-STRUCTURED MATERIALS
BY MICROWAVE JET AT ATMOSPHERIC PRESSURE

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Abstract

For selected applications the plasma treatment of surfaces has big advantage in comparison with classical chemical methods. The plasma activated gas can modify surface layer of various materials with penetration depth around nanometers. In this paper atmospheric pressure microwave plasma jet was used as plasma source. Surface modification is caused by highly reactive species like O, N, OH, which are formed by transfer of energy from plasma excited argon atoms to surrounding air. We report on results of plasma treatments of several industrially important materials like silicon, glass, polycarbonate and polypropylene in bulk form or in the form of microscopic fibers. We analyzed selected parameters like surface energy, surface roughness and chemical composition of the altered layers by contact angle measurements, AFM and by laser desorption ionization time of flight mass spectroscopy, respectively. We observed increase in surface energy and therefore wettability. Slight increase in roughness is not detrimental for intended advanced industrial applications. Plasma spectroscopy was used as other diagnostic tool during nanotreatment. We determined abundance of important atom and molecular species, electron temperature from argon lines, vibrational temperature from nitrogen sequence, gas temperature from OH band and estimation of plasma density from broadening of hydrogen Balmer beta line.

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