Title : Surface Modification of Polycarbonate by RF Plasma Treatment

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ABSTRACT

Plasma has been widely used for surface modification because it induces nanometer-scale changes confined to the surface while having minimal effects on the mechanical properties and optical transparency of materials. This study investigated radio-frequency (RF) plasma surface modification of polycarbonate specimens 3×3 centimeters using 13.56 MHz RF plasma with an input power of 40 W. The initial chamber pressure was 2.2×10^{-2} Torr. Samples were divided into two groups: oxygen (O_2) gas-fed and nitrogen (N_4) gas-fed. The process gases were introduced until the chamber pressure reached 4.4×10^{-2} Torr, with treatment times of 0, 1, 3, and 5 min. During processing, optical emission spectroscopy (OES) was employed to monitor plasma species. Prominent emission peaks at 777.44 and 844.42 nm were observed for the oxygen-fed condition, while peaks at 336.87 and 357.84 nm were observed for the nitrogen-fed condition; these signatures were consistent with oxygen- and nitrogen-related species, respectively, as detected by OES. After treatment, surface wettability was evaluated by water contact angle measurements at 10 minutes and 24 hours after plasma treatment. The results showed increased hydrophilicity at 10 min, indicated by improved spreading of water droplets. However, measurements repeated at 24 hours revealed a tendency for droplets to become more rounded, suggesting a reduction in wettability over time. In addition, surface roughness was analyzed using atomic force microscopy (AFM) to assess changes in

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surface morphology after plasma exposure.

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