



Contribution ID: 231

Type: **Poster Presentation**

polytetrafluoroethylene films Surface treatment of atmospheric pressure three-dielectric-layer barrier discharge plasma driven by sub-microsecond repetitive pulses

Friday, 8 July 2016 14:40 (20 minutes)

Low temperature plasma surface processing is one of the most effective ways to improve the hydrophily of polytetrafluoroethylene (PTFE) films. In order to increase surface treatment area and research the processing effects, a three-dielectric-layer barrier discharge device is used in this experiment. That is, one more dielectric layer is inserted into the gas gap between the primary dielectric layers. And the gas gap between every two layers is equal. Therefore, non-thermal plasma forms between the two gaps. At least one film sample can be treated in every gap. A sub-microsecond repetitive pulsed power generator with maximum repetitive frequency up to 1kHz, voltage amplitude up to 100kV, full-width-at-half-maximum (FWHM) pulse duration 230ns and with pulse rise time 120ns and, is used to drive the discharge device. The discharge device is inflated with Ar/air mixture gas or others. Through the high speed photographs of discharge plasma with exposure time 5ns, it is shown that the discharge is very homogeneous. The PTFE film samples are fixed on one or double sides of the dielectric layers tightly. With a 30s surface treatment time, The water contact angle of PTFE after plasma treatment was measured at an average of 85 degree. Which indicates that the water contact angle decreases obviously compared with a 118 degree value before plasma processing. Besides, some other analytic measure ways, such as atomic force microscope (AFM) or X-ray photoelectron spectroscopy (XPS), will be carried out to acquire the surface morphology or chemical changes of PTFE films.

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Session Classification: Poster 3-A

Track Classification: Plasmas, Discharges, and Electromagnetic Phenomena