Effects of Plasma Power and Reaction Gases on the Surface Properties of ePTFE Materials in Plasma Modification Process

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Abstract

The expanded PTFE (ePTFE) in sheets has been widely used in varied industrial
environments based on its hydrophobic surface, elasticity and porous properties. To enhance its
applications, The surface of sheet ePTFE has been modified by various techniques. This study
devoted to the surface modification of ePTFE by RF plasma system. The operating parameters
including the selected gases (O2, N2, Ar) and plasma power.
The samples present obvious hydrophilic surface after Ar and N2 plasma treatment at a higher
RF power (50 ~ 400 W). The contact angle of 22º can be obtained after N2 plasma treatment at a
RF power of 400 W. The weakening of the characteristic bonds of CF3 and CF2 and the
formation of cross-linked C=N-H layer are the main reason leading to a hydrophilic surface.
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However, further increasing the RF power to 500 W tends to produce a hydrophobic surface due to
the formation of the needle-like surface caused by severe plasma etching effects. It was observed
that the contact angle ePTFE slightly decreases under a lower RF power (< 200 W) in O2 plasma;
however, it showed super-hydrophobic surface under a higher RF power (> 400 W). The main

characteristic bands of didn’ t show any significant change after 02 plasma treatment even under a
higher RF power. The needle-like structure appears on the surface, which leads to
super-hydrophobic properties due to lotus effect.

Keyword：plasma etching, ePTFE, superhydrophobic, plasma power.