

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 22° 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 O₂ 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.