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Semi-permanent hydrophilic thin layer prepared by APDBD for polyester

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Polyester is one of the popular synthetic textiles for lining because of a cheap price. However, polyester feels not good to wear under hot and humid air because it is little hygroscopic and permeability of sweat due to hydrophobic. Additionally polyester accumulates static in a dry air. Hydrophilic treatment is a requisite for comfort and performance of polyester as a lining. There are a lot of methods for the introduction of hydrophilic properties such as grafting, coating, plasma etching, electron beam irradiation etc. However, hydrophilicity introduced by most of the methods becomes extinct with a few washing because of its poor water resistance and low mechanical strength.

In this study, we try to make semi-permanent hydrophilic (SPH) thin layer on polyester textiles using atmospheric pressure dielectric barrier discharge (DBD). DBDs are easily formed and sustained at atmospheric pressure and suited for mass production for textiles. The SPH thin layer was formed by deposition of $\text{SiO}_x\text{C}_y(-\text{H}_z)$ films and plasma oxidation of them. The water contact angle (WCA) of polyester textile was changed from 100° to below 10° after SPH coating. The WCA of polyester with SPH thin layer is below 40° after 20 times washing. We investigated the SPH thin layer properties by scanning electron microscopy, atomic force microscopy, and X-ray photoelectron spectroscopy. We will discuss the influences of elemental composition and chemical structure of SPH layers on hydrophilic behavior of polyester textile.

Keywords

Semipermanent Hydrophilic

Polyester

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Siloxane coating

Plasma oxidation