Breathable Nano-coated Waterproof Functional Textile Surfaces for Wound Dressing Applications

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In recent years, studies on the functionalization of conventional textile surfaces have become widespread. Particularly in medical applications, there are considerable studies on wound dressings. In this study, plasma enhanced chemical vapor deposition (PECVD) was used for hydrophobic surface-functionalization of raw textile surfaces. PECVD is a one-step and all-dry polymer coating technique, in which energetic particles generated during the plasma discharge start the polymer coating reactions. For the top layer of a wound dressing surface, it should be waterproof to protect the wound from contaminated fluids and risk of infection. In addition, the structure should have air permeability and water vapor transmission, as well as good mechanical and thermal performance for comfortable wearing. Within this scope, PECVD nanoscale functional coating technique is used for antibacterial and waterproof effect and biocompatible multi channeled poly lactic acid (PLA) yarns for enhanced air and vapor permeability. In the experiments, hydrophobic monomer vapors were delivered to system until the desired pressure is reached. Next, plasma source was turned on to generate a plasma discharge of monomer. The effects of plasma power and the pressure on the morphology and structure of the coated filaments were studied. Figure 1 summarizes the functional monomers deposited on PLA surfaces in this study. The behavior of the liquids with different properties on the waterproof surface obtained after the study is as in Figure 2.

References

Figures

Monomer	Polymer	Function
Perfluoro decyl acrylate	Poly(Perfluoro decyl acrylate)	Hydrophobic
Hexa florobutyl acrylate	Poly(Hexafloro butyl acrylate)	Hydrophobic
Dimethyl aminoethyl methacrylate	Poly(Dimethylamino) ethylmethacrylate)	Antibacterial

Figure 1: Functional monomers used in this study

Figure 2: The behavior of the liquids with different properties on the standard and waterproof surface