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Transparent oxide incorporation for anti-static polyester fabric

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In textile industry, static electricity generation is witnessed in various high speed processes such as spinning and weaving. Anti–static fabrics are very useful particularly to industrial sector as a means of safety wear (i). Hence, synthesis of anti-static agents assimilated with other properties has become a fascinating area of research. Smart textiles with super-hydrophobicity (ii), anti-microbial activity, anti-pilling activity (iii and anti-static activity can be realized through nano technological approach. Herein, we developed a novel method to synthesize transparent F-doped ZnO (F-ZnO) nanocomposite on textile surfaces in order to introduce anti-static characteristics. In this research, blue color-dyed polyester fabrics were made antistatic by incorporating fluoride-doped zinc oxide needle-like nano-wires in them. First, the Solution-1 was prepared by mixing $Zn(CH_3OO)_2$ and NH4F at molar ratio of 5:2 in (100 mL) ethanol medium. A few drops of Triton X-100 were added while stirring. 0.100 mol dm^{-3} NaOH solution was prepared separately as the Solution-2. Then 50.0×50.0 cm fabric was dipped in Solution-1 and after that it was dipped in the solution-2, respectively. Finally, the fabric was heated at 90ºC for 25 min and dried. The modified fabric was characterized by XRF, SEM, and electrical conductivity determination by the four-probe method. EDEX measurements show the presence of C, N, O, Zn and F indicating that fluoride-doped ZnO nano-needles are present on the surface of the polyester fabric. The fabric surface has an electrical conductivity of 4.63 MΩ cm^{-1}. This is a very easy and straightforward method to attach transparent conducting oxide nano-needles on polyester surfaces and the dipping method can be easily scaled up so that large scale production of antistatic textiles is feasible.

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