Control of Refractive Index by Atomic Layer Deposition on Various Textile Surfaces

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Attempts to integrate various electronic systems and sensors into textiles have been made for future wearable electronics. Conducting textile which is a key component for these wearable electronics is usually called electronic textiles (e-textiles). Since most of conventional textiles are electrically insulator, conducting materials, such as metals, should be added to textiles during or after synthesis processes of textile. In the aesthetic point of view, however, the addition of metal for fabrication of e-textiles has a big disadvantage that is grey and black color of textile from the reflection and scattering of metal components. In addition, the conventional dying technology could not be applied to the e-textile systems after addition of metals due to lack of surface chemical species which are bonded to dye molecules. In our recent paper, we reported that conventional cotton textiles were successfully changed to e-textiles by Pt coating by atomic layer deposition (ALD), and we have produced color coated e-textiles by depositing oxide multilayer thin films. In order for color coated electronic fibers to be used in real life, however, they must have physical and chemical stabilities, in addition, wide compatibility on various textiles. In this work, we fabricated color coated electronic fiber by depositing Al_2O_3/TiO_2 on various electronic fibers to confirm not only the mechanical environment such as tensile, shrinkage and friction which can be exposed in daily life but also the chemical stability due to acid base exposure. By ensuring the mechanical and chemical stability of color coated electronic filaments, it is expected that electronic filaments can be applied to a wider range of applications in the near future.