論 文 の 内 容 の 要 旨

論文題目　Nanofiber-Reinforced Tough Elastic Conductors for Electronic Textile Applications
（ナノファイバーによる伸縮性導体の高耐久化と電子テキスタイル応用）

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This dissertation provides an idea of platform of textile-based wearable electronics for biometric applications. The stretchable conductor for biometric sensing system on textiles has been developed. Stretchable conductors are soft, elastic material which can conduct electricity under mechanical deformations. One of the promising approaches is a composite material which consists of conductive fillers and elastomer because of its excellent performance and a capability of simple printing process. it has been studied and exploited as an essential component of biometric sensors to build a conformable interface between human and sensor devices. However, trade-off relationship between conductivity and stretchability is a major technical challenge of stretchable conductors. Especially, mechanical durability such as cyclic durability remained as challenging issue because improving conductivity tends to make the material stiffer and brittle. Here, the author developed the stretchable conductors with high cyclic durability by using fiber reinforcing effect of textile fibers and electro-spun nanofibers. Newly developed elastic conductor is designed to permeate fibers easily and form fiber reinforced composites. It is highly conductive, stretchable up to 800% when its wrinkle structure has formed (stretchable 70~100% without wrinkles) and showed significant enhancement of mechanical durability; initial sheet resistance of 0.04Ω/sq and resistance increased 4.2 times after 1000 cycles repeated stretching at 100% strain. This robust stretchable conductor was exploited as electrodes and wirings of wearable strain sensor and EMG monitoring garments.