

CNT Coated Fiber “CNTEC”

- Development, Applications and Risk Assessment -

Eiji Akiba

KURARAYLIVING Co., Ltd., Japan
R&D Department

1. Collaboration and Consortium

The Development of CNT coated electro conductive fiber “CNTEC” had started from the collaboration of the basic two technologies. One is the CNT dispersing technology by Dr Fugetsu in Hokkaido University and another is the correct coating technology for the multifilament yarn by Mr Hachiya in Chakyu Dyeing Company. Kurarayliving has a role of the application development of this “CNTEC”. Afterwards, Matsubun Sangyo Company had joined as a yarn supplier and weaving manufacturer, and Owari Fiber Technology Center had also joined as an evaluation center. Now, this project consists of these 5 parties and is supported by the Ministry of Economy, Trade and Industry.

2. Two Basic Technology

One of the important technologies of “CNTEC” is the CNT dispersing technique by the CNT-wetting agent and the stabilizer for the CNT suspension. Zwitterionic surfactants are especially suitable for the CNT-wetting agent and the CNT is dispersed into the tubular levels. This CNT suspension is quite stable to have 6 months life-time and is able to produce by a normal bead-mill. Another important technology is the correct coating method of the multifilament yarn based on the traditional dye-printing technology. CNT network is formed on the surface of every filament with binder. Electrical resistivity is quite homogeneous along to the yarn direction.

3. Targeting Product –1: Antistatic multi-filament

So far, electro-conductive multi-filament has been applied for the antistatic fabric for the uniform of Gas-stand and chemical plant, etc. Electrical resistivity $10^5 \Omega/\text{cm}$ is best for this use, and it is enable to adjust by the amount of CNT on the multifilament. The base material of CNTEC is regular polyester multi-filament. The features of this CNTEC are full-face conductivity, soft touch tactility and high washing durability.

4. Targeting Products –2: Non-metal wire

As an alternative type of the metal wire or carbon fiber wire, we are now proposing $10^{2-3} \Omega/\text{cm}$ CNTEC. One application is the sensor of living body’s current. CNTEC shows the higher anti-bending durability compared with the metal sensor.

5. Targeting Products –3: Fabric heater

Compared with the conventional heater, weaving fabric heater by $10^3 \Omega/\text{cm}$ CNTEC has some good features: thin, lightweight, compact and high anti-bending durability. We are now marketing in the fields of household electrical appliance, car seat, floor heating, anti-freezing material and clothes.

6. Risk Assessment of CNT Coated Fiber Products

We had started to develop the surface conductive CNTEC application, but now concentrating the core conductive CNTEC application. The reason is the risk of eliminated polymer particles including CNT. In the case of core conductive products, CNT coated surface can be blocked by the insulation seal. Even in this case, we have a fear of elimination of CNT including particles and its influence. So, we need the risk assessment of those CNT coated products for the commercial stage.