ELECTRICAL AND MECHANICAL PROPERTIES OF WET-SPUN PEDOT:PSS/GRAPHENE OXIDE/CARBON NANOTUBES COMPOSITE FIBERS

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Smart electronic textiles cross conventional uses to include functionalities such as light emission, health monitoring, climate control, sensing, storage and conversion of energy, etc. New fibers and yarns that are electrically conductive and mechanically robust are needed as fundamental building blocks for these next generation textiles.

On one hand, electrically conductive fibers can be fabricated from nanocarbon materials, such as carbon nanotubes (CNT) or graphene derivatives. These materials are also commonly used as fillers in polymer composites and fibers to impart electrical conductivity and enhance the mechanical properties. On the other hand, intrinsically conductive polymers are gaining increasing attention in this field because they are made of earth-abundant elements, have good mechanical properties and flexibility, and they can be processed using low-cost large-scale methods such as solution processing.

Aqueous dispersions of PEDOT:PSS can be processed into fibers using a traditional wet-spinning process where the polymer solution (dope) is coagulated using a non-solvent (Okuzaki et al. 2003). In this work, we prepared PEDOT:PSS/Graphene oxide (GO)/CNT composite fibers by dispersing GO and CNTs in the PEDOT:PSS dope. We studied the influence of these nanocarbon fillers in the morphology (crystallinity, polymer chain preferential orientation), and in the electrical and mechanical properties of the wet-spun composite fibers.