

Perspectives for Application of Organic Semiconductors to Wearable

Electronics

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Wearable technology is looking for a technological step that could allow to make a significant step forward on the road of a real integration of electronic functions into textiles. The idea is to go from wearable electronics to textile electronics, so avoiding the need to combine two very different technologies as textiles and electronics. This new paradigm needs the elaboration of a dedicated technology that could allow to exploit traditional textile equipments for embedding electronic functions in textiles. The keypoint is the use of suitable materials for implementing on textiles the three basic classes of electrical behavior: conductors, insulators, semiconductors.

Organic materials, based on conjugated organic small molecules and polymers, may be the answer as they can be metal-like, insulators and also semiconductors. Therefore, they offer the opportunity to produce electronic devices on large-area, low-cost, plastic planar substrates. These materials are becoming of great appeal also in the field of e-textiles, as they show an interesting combination of electronic and mechanical properties that can be favorably exploited in smart textiles. A number of applications, as for instance smart textiles systems for biomedical monitoring functions, or new man-machine interfaces, could greatly benefit from this possibility.

Organic semiconductors have the great advantage to be solution-processible, so their employment in a traditional textile coating process is in principle possible.

In this presentation we will give a panoramic view of what is presently possible to obtain in terms of wearable devices produced with organic materials, going from all-plastic “smart films” to apply on textiles or plastic substrates to the new concept of “electronic yarn” that has recently emerged as a possible revolutionary concept for allowing the implementation of electronic in textiles starting directly from the basic block of fabrics.