Toward conducting fibres for intelligent textiles

Ana I. S. Neves,[a] Thomas H. Bointon,[b] Monica F. Craciun,[b] Helena Alves [a]

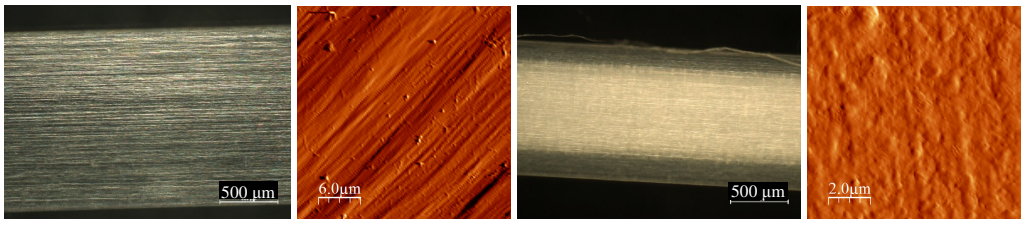
a) INESC – Microsistemas e Nanotecnologias, Rua Alves Redol 9, 1000-029 Lisbon, Portugal

b) Centre for Graphene Science, University of Exeter, EX4 4QL, United Kingdom

e-mail: aneves@inesc-mn.pt

The development of electronic textiles is one of the hottest topics in organic electronics. There are already examples of smart textiles in garments for monitoring physiological and biomechanical signals.[1] However, the manufacturing schemes for current applications rely on the integration of off-the-shelf electronic components mounted on a textile substrate. Such components are silicon-based, thus unsuitable for applications where flexibility and fault-tolerance are required. Organic electronics is an alternative to conventional silicon technology and can overcome those limitations. In this sense, graphene, with high optical transparency and electrical conductivity, is a promising material. Furthermore it can be doped to increase the conductivity.[2]

In the pursuit of conducting fibres, our approach consisted in coating specially designed nanosmooth polypropylene fibres with graphene. Monolayer graphene was grown on copper foils by low pressure chemical vapour deposition using methane as a carbon source, and wet-transferred to the fibres after copper etching. Graphene adhesion to the fibres was found to be very sensitive to minute surface modifications. In that sense, several surface treatments were performed, such as UV light exposure, corona discharge and thermal pre-treatment. In particular, polymer coating was done using different polyimides and coating techniques. AFM microscopy was performed to evaluate the resulting changes in the surface of the fibres, and Raman spectroscopy was used to detect the presence and quality of the graphene transferred onto the fibres.



(a) (b)

Figure 1. Polypropylene fibres used and corresponding AFM images taken at a 90º for: (a) standard polypropylene; (b) biopolypropylene.

References

[1] Witt, J.; et al. *IEEE Sens. J.* **2012**, *12*, 246-254.

[2] Craciun, M. F.; et al. *Nano Today* **2011**, *6*, 42-60.

Acknowledgements: This work was supported by FCT contract PTDC/QEQ-SUP/1413/2012 and by the Royal Society Award ref. IE121126. The fibres were provided by Dr. I. de Schrijver from CenTexBel.