Talking textiles

ove over Volvo and BMW. The next time James Bond hits our screens, he could be fending off the bad guys and escaping death using nothing but his tuxedo. An intelligent tuxedo of course, born from the emerging revolution in textile and intelligent polymer technology.

'Clothing is set to become an active participant in our lives and activities, warning us when we're becoming sick, stressed or drowsy, detecting unusual movement, or actively protecting us from the weather,' says textile scientist Dr Barry Holcombe, of CSIRO Textile and Fibre Technology (CTFT).

The clothing is being developed by CTFT and the Intelligent Polymer Research Institute (IPRI) at the University of Wollongong. It involves amalgamating polymer and textile technology to bridge the gap between conventional clothing and 'wearable electronics': clothing in which electronic devices such as mobile phones are shaped to fit.

'We believe the future lies with truly electronic textiles: fabrics that contain electronic circuits, and can be crumpled, ironed, or thrown on the floor or into the washing machine,' Holcombe says.

The key to these electronic textiles is intelligent polymers, long chain molecules that 'do unusual things'. Unlike conventional polymers, such as wool, cotton or plastic, intelligent polymers can perform a range of functions, depending on their composition. These include sensing temperature or pressure, detecting light, movement or odours, and conducting electricity.

'IPRI researchers have been working on polymers that can conduct electricity in the same way as copper,' Holcombe says.

'They've also developed a device based on polymer sensors that can rate olive oils by their odour, and another that prevents corrosion. And they're looking at "fibre actuators", which react in some way when you apply some form of energy, such as light or a current.

'Once that sort of technology is available, we'll be able to change the shape of yarns in a fabric, or the structure of the fabric.'

Garments could react by becoming thicker or thinner, for example. The pore structure of the fabric could open or close to let air in or keep it out. Or the surface energy of fibres could change to confer water repellent capabilities.

'A lot of these things are well down the track, but we're working on the basic technologies to get them up and running,' Holcombe says.

In the short term, the team has developed an 'intelligent knee sleeve' which is being trialed by the Geelong Football Club. It is hoped the sleeve will help athletes learn how to land correctly, to reduce the chance of anterior cruciate ligament injuries.

'A piece of fabric attached to the sleeve is treated with a conducting polymer that detects the position of a limb. If the knee reaches a dangerous angle, an electronic device hooked up to the fabric beeps at you,' Holcombe says. 'While the polymer isn't integral to the sleeve yet, it's an example of where this technology could go once it becomes available.'



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Holcombe says intelligent polymers may be applied as a coating to conventional yarns, or 'extruded' to produce polymeric yarn that could then be woven into a fabric that is comfortable to wear and attractive to the textile industry.

'The whole thrust of our alliance is to get these technologies into textiles and make them compatible with conventional textile processing, and acceptable to consumers,' Holcombe says.

'We're helping IPRI develop more appropriate polymers, and they're helping us find better ways to apply them.'

In the future, intelligent clothing will be available for a range of applications including sport, medicine, defence, emergency services and leisure. Bond's intelligent tuxedo may not be so far-fetched.

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