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News Bite on PolyU's Innovation

What is next for body protection?

A fabric-based innovation to cushion the blow

A mind-blowing fabric newly unveiled by the Institute of Textiles and Clothing at The Hong Kong Polytechnic University offers more than fashion. The intelligent textile features a shock-absorbing function, and when combined with softness and breathability, it offers flexible body protection. Conventional perceptions about protective gear being thick and bulky will be overturned. Protective gears for knees, shoulders and hips will be more comfortable to wear, allowing that to be seamlessly integrated into our daily lives. The lightweight technology will breed a new line of apparel products for sports protection and elderly care, where freedom of movement is sought-after.

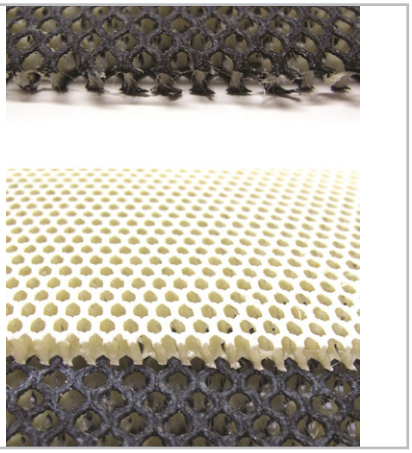
Dr Hong Hu points out that the smart impact protective fabric will be able to replace thick padding as body protection.

Conventional materials for making protection gears are usually rigid, thick and uncomfortable to wear. But body protection will reach a whole new level with a new fabric that produces defence, being newly unveiled by the Institute of Textiles and Clothing at the Hong Kong Polytechnic University.

The new smart impact protective fabric is soft, yet able to turn hard and by doing so mitigate any hitting force going through. "The fabric is impact-hardening, which means, when a sudden force is applied, it stiffens instantly and provides the wearer with utmost protection. When the threat is over, it becomes soft and remains comfortable to touch again. In other words, protection is given only when it is needed," said Dr Hong Hu who heads the research team.

The research team has found a way to make textiles shock-absorbing – by adding silicon gel, a kind of shear-thickening materials that react strangely to impacting force. One common example of these materials is cornstarch used in home cooking. When being stirred, cornstarch gets thicker and thicker, and the resistance makes it harder for a spoon to go in. This peculiar property is being harnessed by scientists to stop the penetration of a blow into human body.

The shock-absorbing quality is strong enough to sustain a fall, according to the research team. "When used for protecting sensitive body parts, it will



Impact hardening fabric treated with silicon gel

A hip protector

Protective sportswear made of smart protective fabric

The innovative technology has won a Gold Medal at the 42nd International Exhibition of Inventions of Geneva in Switzerland.

reduce the impact of forces and prevent painful bruises, cuts and even broken bones on knees, elbows and shoulders," Dr Hong Hu continued. Its breathability, flexibility and light weight also make it more comfortable to wear than rigid protectors.

The breakthrough will revolutionize body protection in sports and at home. In sports, protective gears such as elbow guards, knee braces and chest protectors will be thinner and more stretchable, providing greater freedom of motions. They will be great for recreational and professional sports alike, including cycling, roller-skating, skiing and American football, which carry high risks of falls or crashes. "This thin sheet will be able to replace thick padding in protecting our body when we engage in sport activities," said Dr Hu.

Proper safeguard is also essential for the elderly at home. Fall accidents threaten the well-being of seniors, especially for those with osteoporosis. Since undergarments can be turned into hip protectors or knee braces to prevent bone fractures, seniors wearing them will be less prone to broken hips and knees, which will increase their dependence on the help of others.

Another major application area of the smart impact protective material is military operations. The lightweight technology can be transformed into soldier suits that prevent regular injuries from everyday duties. This is exactly what authorities have been looking for to replace heavy and cumbersome protection currently employed.

Scientists foresee a time when protection is integrated seamlessly into our daily lives, where we can get around in comfortable garments and we won't even know protection is there. Fabric-based protection offers many garment design possibilities, allowing protective suits to be designed in any shape and style.

"The technology is practical and creative, and we will see such garments in stores in the near future," added Dr Hu. The homegrown innovation has won a Gold Medal at the 42nd International Exhibition of Inventions of Geneva in Switzerland.