Multi-functional Shape Memory Fabrics

The Institute of Textiles and Clothing of the Hong Kong Polytechnic University (HKPU) was granted a fund by the Innovation and Technology Fund in 2003 to subsidize a technological research project named Development of Shape Memory Fabrics/Garments. After taking extensive research, the team finally develops a polymer which contains the shape memory function, laying the foundation for a completely new textile fabric. Because of its wide variety of functions, this new material is bound to foster the development of the textiles and clothing industry.

A way to make a "Smart" dress
Have you ever thought that we can enhance our clothes' memory in much the same way as we train to increase our memory power so as to make them wearable and comfortable? In fact, curiosity was the force that drove the researchers to successfully develop this material.

Professor Jinhuan Hu of the Institute of Textiles and Clothing began the research on "intelligent" fabric shortly after joining the HKPU in 1994. As the project coordinator of this research project, she has spent a total of eight years on this quest for "intelligent" fabric. In 2001, Dr Hu became the first scholar in Asia to receive the Fibre Science Achievement Award by the US-Based Fibre Society.
In 2003, the project “Development of Shape Memory Fabrics/Garments” obtained 6.3 million-grant by the Innovation and Technology Fund. In addition, the project received financial sponsorship from 4 private companies including Bondex International (Hong Kong), Hong Kong Hi Tech Enterprise Ltd, Lai Tak Holdings Ltd and TAL Apparel Ltd. to establish the world’s first Shape Memory Textiles Centre located at the HKPU. Scheduled to operate for 2-year duration, this project is due to generate results. The next step is to enable manufacturers to produce this fabric for the market.

What function does this innovative fabric possess? What special effect does this function produce? The research project carried out by HKPU points out that having subjected to special treatments, this fabric possesses a shape memory function. Able to withstand high pressure, this fabric can recover to its original shape at a designated temperature. This can allow a fabric to have functions of wrinkle-free, shrink resistance, easy-to-wash quality and good chemical resistance.

World’s first patented technology

The world’s first, this technology to make a fabric contain shape memory functions has applied for various patents in Mainland China, USA and other countries. The crux of this technology is to add a special kind of polymer called Shape Memory Polyurethane into a fabric. This polymer has a wide scope of usage. It has been used in medical products, industrial mixed materials, cosmetics, toys and various manufactured products. The researchers at HKPU were the first in the world to apply it to clothing fabrics.

Garments made from this shape memory fabric will return to their original shape and softness after they have been soaked in hot water (at about 60°C) or worn at body temperature, even after being pre-pressed with wrinkles. Compared to other wrinkle-free fabrics, this new material is stronger and able to withstand tension. Also its moisture-resistance and air-permeability are better. Therefore, it is very comfortable to wear clothes made from this new fabric. In addition, this new fabric will not shrink or expand. Nor will it turn yellowish after repeated washes and long time use. In short, it is an ideal fabric for the textile and clothing industry. Furthermore, the joint areas of some clothes often change into a half-sphere shape (bagging) after a long period of wear, but clothes with the shape-memory treatment will not show this vault shape after they have soaked in hot water. One’s hand feels very comfortable when it touches the fabric, besides being chemical-resistant it can be washed using detergents.

In applications, the shape memory polymer can adopt different forms – liquid, powder, tablets, fibre, membrane or thread. Researchers at the HKPU are trying to combine this shape-memory fabric with other clothing fabrics to determine whether it can be applied directly to the manufacturing of garments. Recently, they succeeded in applying it to beauty mask products by taking advantage of this new fabric’s moisture/nutrient-release characteristic when heated. This is considered as one of the contributions to the cosmetics industry.

The cost will be 10% higher if clothes are subjected to shape-memory treatment, similar to that of wrinkle-free treatment. Although this new technology has not been officially put on the market, companies in the industry are welcome to contact the Partnership Development Office (PDO) at the HKPU if they are interested in licensing this new technology. One of the departments of HKPU’s Institute of Enterprise, PDO is in charge of bridging the university with private enterprises to fulfill the mission of fostering a long-term partnership between the university’s academic experts and the commercial and industrial sector. In this way, the tremendous resources and full potentials at HKPU can be put to use to serve the community.