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## Nanotechnology Creates Super-Strong Fibers for Bullet-Proof Vests

Researchers at the Hong Kong University of Science and Technology (HKUST) have developed a new technology that can greatly enhance the ballistic-proof strength of ultra high molecular weight polyethylene (UHMWPE) fiber by adding carbon nanotubes to pristine high-strength fiber.

Jointly developed by the Departments of Chemical Engineering and Mechanical Engineering, the new technology is expected to pave the way for new UHMWPE applications, such as more comfortable and effective bullet-proof vests and extra-durable nautical rope.

Carbon nanotubes can improve the engineering properties of plastic fibers in ballistic-resistant garments enabling the garments to withstand forces with very high impact yet remain light. In addition, the high ventilating capability of carbon nanotubes means end products can be made more comfortable for users.

The HKUST technology represents a significant breakthrough for researchers. Dr Ping Gao, Associate Professor of Chemical Engineering, said: "The technology we have developed can effectively align nanotubes along the length of polymer fibers so the tensile strength of nanocomposite fiber becomes up to eight times stronger than steel."



Dr Shilun Ruan demonstrates the strength of the new fibers while Dr Ping Gao looks on



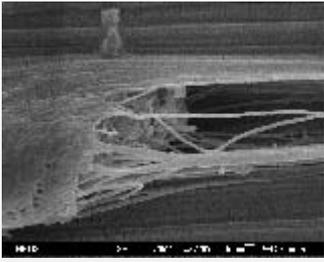
Prof Tong-Xi Yu says the new fibers can be used to produce bullet-proof vests

Prof Tong-Xi Yu, Chair Professor and Head of Mechanical Engineering, added: "Materials with higher ductility are usually softer. The stiffer the materials, the less ductile they are. Our technology creates fibers that are both stiff and ductile-the ideal material for energy absorption."

Postdoctoral researcher Dr Shilun Ruan, who fabricated and characterized the new materials during his PhD study at HKUST, said the materials could be utilized in both engineering and our daily lives. They can replace anti-ballistic and durable steel or other alloys as well as being used in many everyday products to enhance performance.

"As the materials can withstand very high tensile force, they can be used, for example, to produce tennis racket threads with stronger elasticity. When used as strings for musical instruments, the nanocomposite fibers can also generate beautiful, high-quality music," Dr Ruan said.

Dr Gao noted that the Hong Kong plastic industry has become more aware of the market potential of engineering plastics. This latest technology developed at HKUST will help the industry to enhance its competitiveness further.



SEM image  
of the new fibers