

PROTECTIVE PROPERTIES OF CLOTHING IN THE SECURITY SECTOR

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Developments in the field of technical or high-performance textiles have led to the production of clothing, protecting the human body from various impacts. Protective clothing must be made of such fabric or material as to be resistant to the effects, for example, fire, radiation, hazardous chemicals.

Textiles are an important part of most protective equipment. Aramid fibers are mainly used. The essential thing about them is that they are extremely strong and have high heat resistance, they are used in aviation and military applications, for ballistic body armor. Kevlar is a para-aramid fiber that exhibits moisture and rot resistance, is characterized by exceptional strength and heat resistance properties and is indispensable in the production of body armor and worker clothing. Unlike Kevlar, Nomex fibers have a lower modulus of elasticity, but are nevertheless characterized by excellent thermal, chemical and radiation resistance. Twaron is p-phenylene terephthalamide (PpPTA), a para-aramid, and has applications in the aerospace industry and the military, for example in modern body armor.



The main advance in ballistic performance is attributed to PBO (poly(p-phenylene-2,6-benzobisoxazole) fibers, which are trademarked by Zylon. This fiber allows the design of a soft body armor that is 30–50% lower in mass compared to aramid and UHMWPE materials. Akzo-Magellan (now DuPont) teams are working on fibers called M5 fibers. A material developed by the Israeli company ApNano, which is a nanocomposite based on tungsten disulfide nanotubes, is able to withstand impacts generated by a steel projectile moving at speeds of up to 1.5 km/s. In recent years, the application of graphene as a material for body armor has begun. Graphene has become a valuable and useful nanomaterial due to its extremely high tensile strength, electrical conductivity, transparency, and being the thinnest two-dimensional material. The Gore-Tex trademark material is a waterproof, breathable fabric membrane suitable for protective heat-resistant clothing and at the same time for durable weather protection.

The selection of materials is extremely important to protect the human body from various harmful and dangerous effects. For example, aramid textile materials such as Kevlar and Nomex are suitable for firefighting and military clothing due to their exceptional resistance to high temperatures. The material Gore-Tex is a composite material consisting of several separate layers; it is applied not only in sports equipment, in medicine, but also in protective clothing. In addition to protecting against extreme climatic conditions, this material is resistant to chemical, biological and thermal effects.

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