

The application and the market potential of polymer materials in competitive sports

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Abstract: It is easy to get injured for athletes in sports, and the pursues of sport is get higher, faster, stronger and more accurate sports record. At the same, most of the sports needs the different equipment to protect us, make us more comfortable or get better achievements. This equipment is matched by kinds of materials. The polymer materials make an important role in all the materials worlds and have great market potential at different aspects and situation. So, it is significant to study the properties of kinds polymer materials and its commercial prospects. In this study, we make a practicable study about parts of polymer materials and take an investigation in its markets. We find that polymer materials can be divided into many kinds of materials, and sports polymer materials can be used to protect the human body from external force. They can keep warm, waterproof and windproof, and have the application of ventilation and scattering. In addition, polymer clothing can also be used as auxiliary equipment during sports to achieve better results. For example, shark skin bionic swimsuit can make athletes have less resistance in the water, so as to swim faster and achieve good records.

1. Introduction

Polymer materials products and technologies are applied extensively in our lives, which unites the advanced properties of many materials and theories about physical in various aspects.[1] Athletic suit is an obvious aspect in the sports, which can make us more comfortable and interesting to take those risky and challenge project, like the climbers and skiers are need to maintain themselves body temperature and avoid freeze in the word of ice and snow. [2]At this time, the polymeric cold proof clothes and tents are necessary for them to resist cold environment. In the normal sport projects, an appropriate polymer suit may make those hobbies more attractive, which suits always requirement the materials wear-resisting and heat -dissipation.

In terms of cold protection and warmth preservation, polymer fibers are often processed into fibers of different sizes. [3] The outermost layer of these equipment is often prepared with thicker fibers, which often have better wear resistance, which can well protect the inside of the material. For example, the outside of the tent is often made of a thick layer of fiber, which can effectively

prevent the tent from being easily torn during the use of outdoor athletes. [4] On the other hand, when people wear a thick down jacket, they will find that the outside of the down jacket is often composed of thick fibers. On the other hand, thermal polymer materials can still be processed into curly mass fillers, such as filamentous polymer fillers in the middle of down jackets. [5] The interior of warm clothes is often made of fine fibers. The benefits of this will be described in detail in this paper.

After being woven into a fine cloth, it has a good wind proof function. Under the combination of fine stitching and high polymer adhesive tape, even if a garment is made of thin cloth, it also has excellent wind and rain proof function, which enables athletes to exercise without heavy clothes. Breathable and warm fabrics are often used to prepare winter sportswear. Clothes and fabrics are often selected with appropriate thickness, so that athletes can maintain sufficient body temperature to maintain body function without overheating themselves. Of course, this is the best choice under the condition of ensuring that athletes' sports are not bound. Apart from the above, heat dissipation polymer materials are also very important. Especially when athletes do sports in summer, the body will need more heat dissipation, and the sweat on the skin also needs to evaporate quickly, which further improves the selection requirements of polymer materials. In summer, sports clothes are often made very thin, but they still have to bear the high load of athletes, which provides a good market application prospect for the development of high-strength polymer materials, and also has higher requirements for the fiber strength of clothes.

When people swim, they hope to encounter less resistance in the water, and the new polymer swimming suit can replace the connection between human skin and water, greatly reducing the resistance when people swim in the water. At the same time, polymer materials can reduce the loss of human heat and avoid hypothermia while contacting human skin with water.

Polymer fiber is in the process of making cloth, or cloth is in the process of preparing sportswear. Reasonable design can give full play to the application value of polymer materials. For example, basketball clothes are often designed as short sleeves, which greatly improves the heat dissipation effect of athletes during sports. Furthermore, many tiny holes will be designed on the cloth of many heat dissipation clothes, which further improves the heat dissipation effect of sportswear.

2. Waterproof clothing

Waterproof clothing, as shown in Figure 1, is divided into simple double-layer structure. Both external and internal materials are composed of polymer materials. On the outside of the clothes, it is composed of polymer fiber materials.

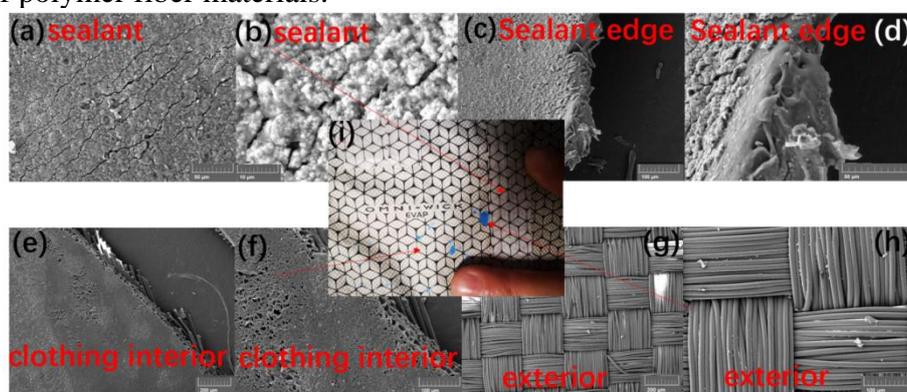


Figure 1: Waterproof clothes (a), (b) paste the front of the adhesive tape, (c), (d) paste the side of the adhesive tape, (E), (f) inside and outside the clothes.

These materials are closely woven together, and there are no holes between the fibers, so that the outside of the clothes has a preliminary waterproof function. Relatively speaking, the interior of the

clothes is a piece of integral polymer materials, which are made into a whole so that there are no holes between them. This material is tightly covered on the polymer fiber of the outer fabric of the clothes, which makes the whole fabric waterproof. For the whole garment, these materials are closely pasted together by polymer waterproof tape. As shown in Figure 1 (A-D), there is no sewing thread here, which can well avoid leaving holes when the sewing thread passes through the cloth. Therefore, such clothes have good waterproof function and excellent windproof function, which greatly reduces the injury of outdoor athletes by wind and rain, thus taking away the heat from the body and reducing the sports ability.

3. Warm clothes

In terms of protecting human body and heat preservation, clothes are not enough to be waterproof and windproof. Therefore, it is necessary to find other kinds of clothes to help athletes keep warm. Padded jacket is a kind of three-layer warm clothes with filling inside. It has the characteristics of light weight, fast dehydration and good warm keeping effect. In the process of athletes' sports, such as skiing and mountaineering, this kind of non bulky clothes can bring great convenience to athletes. At the same time, it is made of chemical fiber, but if it comes into direct contact with the skin, it may reduce the sense of experience, or even cause skin allergy in serious cases. Human skin prefers naturally growing fibers, such as animal fur and plant fibers (cotton). Here we only advocate the use of plant fiber, so we summarize the warm clothes prepared from plant fiber. These clothes, regardless of their thickness, have good warm keeping characteristics, air permeability, sweat absorption and deodorization. The fibers of these plants have less excellent ductility and smoothness than chemical fibers, so they are used as parts close to the human body, because these parts have a small deformation range during movement.

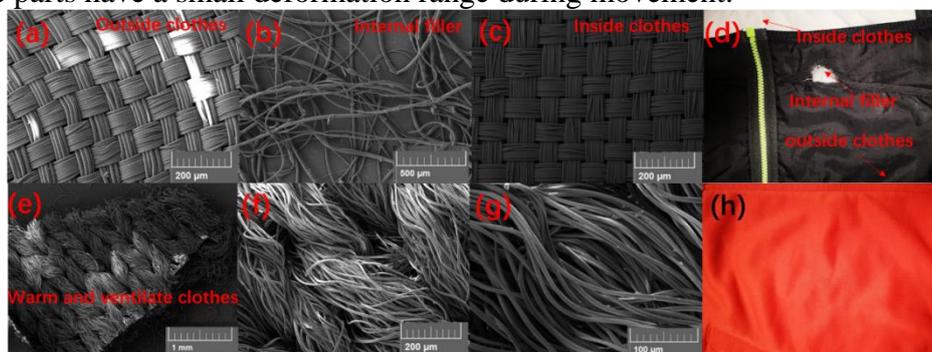


Figure 2: Padded jacket(a-d), (a) Outside clothes (b) Outside clothes (c) Inside clothes. (d) real cloth. (d-h) Warm and ventilate clothes.

3.1. Padded jacket

Padded jacket is a kind of fashionable and convenient warm clothes. This kind of clothing is often worn to the outermost layer of the human body. This kind of clothes consists of three layers of materials of different thickness, as shown in Figure 2. The outermost layer of clothes is woven by a thick layer of chemical fiber. This layer of clothes often has high strength, wear resistance and flexibility, which is to make the clothes not easy to be broken during outdoor sports. The middle fillings of clothes have many choices. The fillable thermal insulation materials can be feathers, cotton or even chemical fibers. The main function of this layer of materials is to isolate the wind blowing into clothes and retain the heat emitted by the human body. The interior of clothes may be in contact with human skin or other underwear. Compared with the external cloth of clothes, the interior of clothes is often composed of cloth imitated by a thin layer of fibers, which greatly

reduces the friction between clothes and other clothes. The outside and inside of the clothes is combined to form a sleeve, so that the filler can be perfectly placed inside. Therefore, the thermal insulation effect of this dress on athletes has been further improved.

3.2. Warm and ventilate clothes

Warm and volatile clothes are warm clothes designed for comfort. As mentioned above, these clothes are often worn to the position closest to the human body. The materials of these clothes are often made of existing fibers in nature, such as wool, cotton and other materials. These materials not only bring comfort to people, but also have the function of keeping warm. Of course, such clothes can also be worn alone or outside. At the same time, the clothes inside are designed to have a lot of thickness. Therefore, warm and volatile clothes have more flexibility.

4. Cooling coat

Many times, people will produce a lot of heat during exercise, especially athletes. Therefore, sports clothes with good heat dissipation effect are very popular. In this article, we mainly discuss the design of clothes and the discussion of cloth materials and structure, as shown in Figure 3.

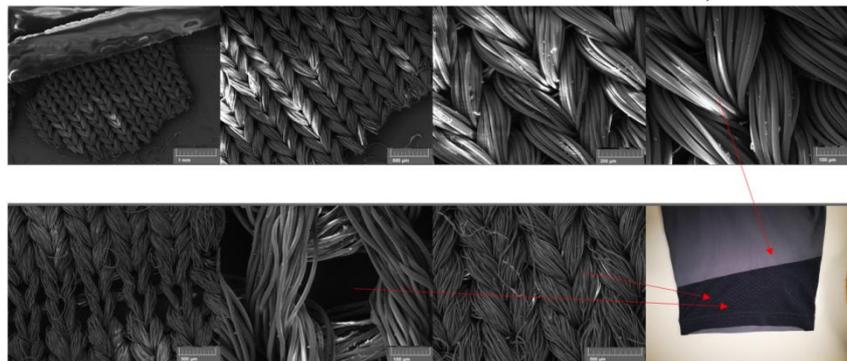


Figure 3: A pair of Sweatpants,(a-d) The dense area of trousers, where the material is made of Meryl materials. (a-d) The loose area is also composed of Meryl materials, but the textile method of the cloth has changed, and dense heat dissipation holes are processed on it.

4.1. Clothing design

The design of clothes is very important for heat dissipation. For example, when playing basketball, people often like to wear short sleeved vests rather than other kinds of clothes. On the one hand, it is because the sports vest has less bondage to the human body, on the other hand, it is because the basketball vest has a good heat dissipation effect. In terms of casual people, short sleeves are often people's first choice, which can make athletes' skin more in contact with the air, so that the heat of the human body can be directly radiated to the external environment. Sweat on the skin can evaporate faster and take away heat, which improves the performance of athletes.

4.2. Fabric material and structure

The idea of cutting short sleeves and trouser legs is not the only cooling option. Sometimes, the athletes need to wear protective long sleeved clothes to exercise. Therefore, the choice of materials and the structure of cloth have become a new research direction for designers. As shown in Figure 3, the material selected for the pants here is a material with good heat dissipation effect, which is called Meryl materials. This material is designed to be very thin and has good scattering effect. As

shown in Figure 3, the pants made of Meryl materials are divided into two parts. The dense areas above are closely woven with fibers, which mainly bears the load during material movement and have good heat dissipation effect. In the lower part without sports load, Meryl materials are designed as loose woven cloth. At the same time, many regular and dense holes are designed on the cloth. Therefore, although this greatly reduces the load performance of the cloth, it greatly increases the heat dissipation performance of the material. Here, the outside air is easier to penetrate the material and take away more heat. Therefore, the individual effect of athletes is better.

5. Swimming trunks

When swimming, it can motivate people to ask for faster speed. A good swimsuit can reduce the resistance of athletes in the water. Like Phelps, he can achieve record breaking results in the world swimming competition. In addition to his own talent, his science fiction swimsuit also plays a part. Therefore, the choice of swimsuit material and design determines the quality of a swimsuit, which will eventually affect the sports quality of athletes.

6. Conclusion

Athletes often consider more appropriate sportswear in the process of sports. In terms of sportswear, the options considered are windproof, waterproof, warm, heat dissipation and less exercise resistance. In many cases, polymer fiber materials can meet most of the sports requirements, and the existing fibers in nature will also play a good role. The combination of various fiber materials is often better for the sportsman.

7. Method

The model of scanning electronic fiber mirror we use is TESCAN MIRA3. At the same time, all samples are real sportswear bought from the market.

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