

Nanometer Technology and the Development of Competitive Sports in China

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Abstract — In the 1980s, Comrade Deng Xiaoping put forward a famous thesis "science and technology are primary productive forces", which has been proved by a large number of facts in the development of modern science and technology. The development of modern science and technology penetrate into all aspects of human social life including sports, providing a powerful impetus to understand and transform the world. According to "Sport Reform and Development Outline", that "Adhere to the development of sports undertakings must rely on science and technology, sports science and technology work must be oriented to sports practice approach, and constantly improve the technological content of sports," which put forward the clear request for the sports science and technology work in the new period. The latest achievements in materials science aspects of the application of sports equipment can improve athletic performance direct impact, which has been proven by practice sports. In this paper, Using documentation and investigation of the close relationship between the nano and development of competitive sport development in China were studied, the effect of the development of nanotechnology in modern sports science and technology on competitive sports in China is discussed to illustrate China's high-tech role in promoting competitive sports.

Keywords - Nanometer technology; Competitive Sports; Nanometer material; Application

I. INTRODUCTION

The rapid development of modern science and technology in sports produced an unprecedented impact of science and technology has become a sport of decisive significance level of development of the important factors. The development of modern science and technology penetrate into all aspects of human social life including sports, providing a powerful impetus to understand and transform the world. According to "Sport Reform and Development Outline", that "Adhere to the development of sports undertakings must rely on science and technology, sports science and technology work must be oriented to sports practice approach, and constantly improve the technological content of sports," which put forward the clear request for the sports science and technology work in the new period [1,2,3,4,5].

A. Overall Developments of modern Sports Science and Technology Trends

The development of modern science and technology greatly contributed to the advancement of sports science and technology, and the performance of high-tech means are widely used in sports training, which improve the scientific level of training, and promote the sport of skill levels and increasing competition results[6,7,8].

Modern Olympics is largely technological contest between participating countries, it is not only the strength of the concentrated expression of Sports Science, but also to the biological sciences, information science, materials

science and other areas of high-tech on the involvement and impact of competitive sports.

For example, the latest products in the biological sciences in the use of sports athletes endure significantly increased training load capacity and athletic ability; Information Science, new achievements greatly improve the training and competition information collection, transmission and processing capacity; materials science new product, directly contribute to the improvement of athletic performance and so on [9,10,11,12,13].

B. Sport Technology Status and Growing Role

Since the level of modern competitive sports is reaching higher and higher level, to improve athletic performance becomes more and more difficult. In order to win the major international events and to standing out in the Olympic Games, the world sports power in applying the latest technological means and strive to tap human potential movement, which greatly promoted sports research work in depth.

Since the United States lost to the former Soviet Union and East Germany in the 1976 Olympics, they made a determined effort to learn the director of the Eastern European, strengthening scientific research and sports training. In 1977, United States Olympic Committee established the first Olympic Training Centered an altitude of 2 000m of Squaw Valley, followed by they established the second Olympic Training Center in the United States Colorado Springs, where the Olympic Committee headquarters is located in[14,15,16,17].

In these centers gathered in a number of biomechanics, nutrition, physiology, psychology, computer specialists and other disciplines to carry out scientific research and technological services Sport, with the coaches for scientific training and technical judgment. Such research and sports training sports training center integration played a significant role on technical levels on the progress of the United States. According to statistics, each year 12,000 - 15,000 athletes training in that center, including all the top athletes in the United States. According to reports in September 1995, another Californian center called "Arco Training Center", which lasted four years and cost \$ 65 million, covers an area of 150 ha, has been put into use. Former Soviet Union had long sporting world hegemony, which with its world class sports research institutions and research teams is closely related. As early as the 1930s, the former SU founded an independent sports research institutes. Its famous All-Union Research Institute had 1700 people in its heyday, while around 800 people in Countries Sports Science Research Institute of the former East German.

In addition, Italy, Spain, France, Australia, South Korea and other countries also have established a specialized agency of the State Sports research [18,19,20].

II. MATERIALS SCIENCE AND APPLIED RESEARCH AND DEVELOPMENT STATUS AND PROSPECTS

A. nm, Nanotechnology Definition of Nanomaterial

Nano concept is completely different from the traditional concept of a scientific concept. Any substance into a particle size in the nanometer - 100 nm range of scales, it will be a qualitative change in the nature, which provides us endless opportunities to architecture of new functional materials with this changed the nature.

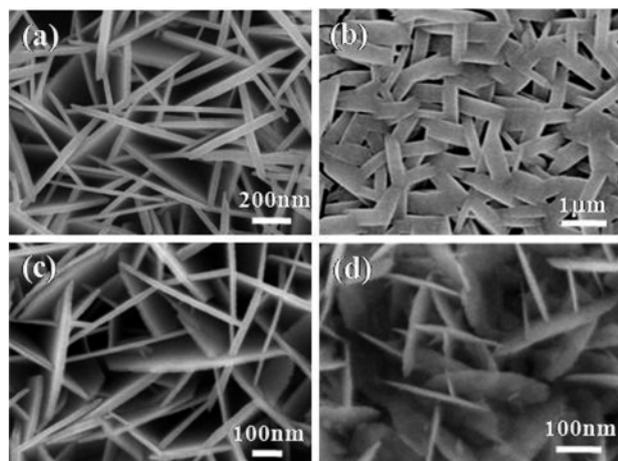


Fig.1 α -FeOOH: a Morphology of Nanomaterials

Of course, the nano materials, a very important part is to characterize the morphology, Different materials have different morphologies, the same kind of material synthesis conditions and the mechanism formed by not the same, will have different morphologies. Fig.(1). is the morphology of nanomaterials α -FeOOH[21], Referred to as "nano -yellow iron "in Chinese. This picture on the image of the performance of the morphology of α -FeOOH, Visible, 100 nm, 200nm and $1\mu\text{m}$ ($1\mu\text{m} = 1000\text{nm}$) of the α -FeOOH has a different shape.

A nanometer is a unit of length; it is in English Nanometer the Chinese translation of "Nano Mitt" for short. English prefix in the Nano means a billionth part .Therefore, a nanometer is a billionth of a meter. Nanotechnology is at 011 nm to 100 nm within the space of movement of material composition and interaction of the system as well as the practical application of technical problems in science and technology, and was listed as one of the key technologies in the 21st century. Nano-technology and Nano-technologies have two important parts, including structural materials technology. Nanostructure However, Nano-materials technology, due to its wide application to ask, any call of the material with functional material, and the structural unit by the Nano materials are brought Nano materials. All material nanostructure unit has changed the nature of any new substances are likely to frame new features, it can be prepared new material.

B. nm in Competitive Sports Applications

In the modern competitive sports, Nanotechnology is increasingly used in sports equipment and equipment. Using montmorillonite (MMT) intercalation technology plastic material made of the runway, its mechanical performance has been greatly improved; The reinforced plastic nylon spacer made of glass fibre, using five different fiber produced conjoined tight sportswear can affect the temperature and reducing the resistance; the "crystal shoes" made of transparent plastic; Produce the bicycle frame made of carbon fibre material with light weight and high strength , and make it through the wind tunnel experiments modelling to achieve optimal state resistance . New competition clothing, "sponge pit" The emergence of gymnastics, the project's technical skills action occurs a revolutionary change; using new materials produced "shark skin" swimsuit at the Sydney Olympic Games swimming competition help Thorpe won the gold medal. In 1991 Japan and the United States Mizuno Corporation produced a weight of only 115g (lighter than ordinary shoes 20g) dedicated running shoes for famous American sprinter Lewis, the soles are a special glue, tacks ceramics, Lewis wore it at the Seoul Olympics in 9186s broke the world record , winning the gold medal. This high-tech exercise equipment will undoubtedly increase the athlete winning chips. Sports equipment

improves the technological content, but also to improve athletic performance in an effective way. Nanotechnology tentacles always have been more than people's imagination, 2005 Rowing World Cup in England station, the last 100m race, the Shanghai team in the women's eight boat with the help of nanotechnology, leading opponent 5m much, why is there such good results? The reason is that the original hull surface is uneven countless mini figure nanoparticles filled one by one, even more amazing is that researchers draw inspiration from the lotus leaf, a little flick adhere to the hull surface collections of water droplets on will be rolled homeopathy, game, water and hull are not mutually entangled, rowing boat naturally became a leaf .China Ship Scientific Research Centre of the real ship water resistance test showed that a thin layer of Nano-membrane helps boats reduced by 1% to 115% of the flow resistance. And Nano-DRA had no effect on boats colour, weight and water, which full compliance with international competition contest rules. Tennis

rackets from chipped wood to carbon fibre, the use of Aeronautical Materials, tennis racket on the ball strike force, friction, quality and comfort racket have been greatly improved, so that tennis has become a popular global movement .Currently, the use of Nano technology to produce a variety of functional fabrics have made great progress, such as antibacterial, deodorization. By Nano scale TiO₂, ZnO₂, SiO₂, etc. photo catalytic antibacterial agents and chemical fibre blend spinning obtain persistent antibacterial fibre, far beyond the traditional antimicrobial antibacterial properties. In recent years people has been able to mass submicron and Nano-antibacterial agent, through the introduction of chemical fibre blend into the design as antibacterial sportswear. In terms of waterproof, the use of nanotechnology-treated waterproof fabric lining is not only super-hydrophobic, oleo phobic singularity, but also to maintain the original features and characteristics of any of the fabric, and does not contain harmful chemical ingredients.

TABLE I. THE PRACTICAL APPLICATION OF NANOMETER TECHNOLOGY

Number	Categories	Product	Main material
1	Reduce the resistance	The boat material :reduce the resistance of the coating	With strong hydrophobic/light-cured and fluorine-containing wax matrix material, Embedding and microscopic nanoparticles dispersed in a matrix of polishing effect wax.
2	Reduce the gravity; improve performance	Nano bicycle	Carbon-nanotubes new materials and aluminum.
3	Enhance elasticity; enhance the robustness	A vaulting pole	Nano-carbon fiber materials.
4	Water-resistant	Water resistant clothing	These plants are through nanotechnology and DWR treated.
5	Protect; health protect	Protective clothing	After photo catalytic nano-TiO ₂ , ZnO, SiO ₂ and other antibacterial agents and synthetic blend spinning antibacterial fiber

C. *nm in Practical Application*

For example, a table above, nanotechnology that is widely used in Sports, it improves the athlete's performance. Here, in order to let everyone know more about, one example cited by category. (1)In terms of reducing resistance, the boat material :reduce the resistance of the coating, it's material with strong hydrophobic/light-cured and fluorine-containing wax matrix material Embedding and microscopic nanoparticles dispersed in a matrix of polishing effect wax, greatly reducing the boat's resistance; (2)In terms of weight reduction and improved performance, emergence of nano bike for athletes to bring the Gospel, nano bike is mainly made of Aluminium and new materials containing carbon nanotubes, greatly reducing the weight of the bicycle, so that athletes can better play their achievements; (3)Nanomaterials increase the flexibility and increase the firmness of respect, the sport of pole

vault use of nano-materials, produced a strut, it is mainly used for the nano-carbon fibre material, this material increases the elasticity of the strut, to create the conditions for the athletes to improve performance, but also increase the firmness, to protect the safety of athletes, it is made of nano-carbon fibre materials;(4) In water-resistant, nanometer new fabrics, waterproof better, and have better permeability, so that athletes can wear more comfortable, These plants are through nanotechnology and DWR treated;(5)In the health sector, nano protectors have active heat, close protection and other functions, it can protect the athlete's joints better, to provide protection to enhance athletic performance.

D. *The Role of Nanotechnology*

Development of Nano sports development is to improve the effectiveness and efficiency of competitive sports growth point. Since 1981, American scientists

invented the first scanning tunnelling microscope, the Nano-technology has become more crazy than the network, more terrible than cloning, the most advanced and cutting-edge modern technology, the development momentum of fairly rapid. It appears that will revolutionize human life and philosophy. Modern sports competition is modern technology competition. It is foreseeable that in the near future, the competitive sports is largely nanotechnology competition, the 2008 Olympics will be a magical magic Nano sports, big-stage performances. It is foreseeable that the United States which has mastered nanotechnology leadership must have been in the creation of Nano sports a world leader. China in the field of nanotechnology has made gratifying achievements, and the goal is to become a world leader within five years. The emergence of nanotechnology and the extensive use of sport, sport will lead to a profound revolution, if we still use the traditional perspective sports, using old-fashioned way to engage in training, and inaction on the Nano sports, and even act as a layman, is bound to fall behind to suffer losses. Time waits for no man, and all levels of the State Sports General Administration of Sports of the decision-makers must have a sufficiently keen sense of smell, and sports science and technology workers must have the ideas to put into the sport of nanotechnology research.

III. RECOMMENDATIONS

A. *Establishing Nano Sports Research Institutions, it is a Means to Promote Sports Development*

Establish Nano sports research institute, allocate special funds, set the Chinese Academy of Sciences as a knot mouth, joint research nanotechnology strategy and development planning, produce results as soon as possible, produce benefit as soon as possible, which can supply service for more Olympic Games and international competitions at an early date.

B. *Based on Nanotechnology and New Materials Innovations*

Starting from the development of Nano-materials, developing Nano sports devices which can greatly improve athletic performance as early as possible, we can try to make use of nano-materials, through processing of different methods, thus, made more conducive to athletes performance-enhancing sports equipment. Such as better performance equipment: Nano-running shoes, Nano-jumping shoes, Nano-pole, Nano-swimwear, Nano-rackets, etc.

CONFLICT OF INTEREST

The authors confirm that this article content has no conflicts of interest.

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