

Nanotechnology in Sports

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Introduction

Nanotechnology is a branch of research that has gained much momentum in recent years due to its wide application of its principles and products. The application of nanotechnology research ranges from fields such as disease prevention and treatment to advanced and improved electronic devices. Nanotechnology has even found applications in the wide field of sports. Within the niche of sports, nanotechnology has proven to be very useful, and has the potential to improve a broad range of aspects of the sports world.

Project Description

Scientists are always looking for new and innovative ways to improve existing products, and sports equipment is no exception. Already, scientists have found numerous applications of nanotechnology to improve current sports technology. These improvements range from creating stronger, yet lighter, golf clubs to taking away the odor normally associated with dirty sports clothing after it has been used.

The game of tennis is a prime example of how nanotechnology is having an interesting impact on sports equipment. According to present research, equipment producer Wilson has been able to create tennis racquets that are twice as stable as conventional racquets, and up to 22% more powerful. [1] This increase in the racquet's performance capabilities can lead to big speed increases in what is already an extremely fast-paced game. In addition to racquet research, Wilson is also conducting research to find innovative ways to improve the tennis balls used today. This research has allowed them to design balls that hold their bounce much longer than is seen in balls currently available on the market. This is accomplished by bonding microscopic balls of butyl rubber with clay particles. This mixture is then applied to the inner layer of the ball, creating an airtight but still flexible boundary that keeps the gas inside the tennis ball much longer. [3] A visual explanation of the results of this new airtight boundary is found below in Figure-1.

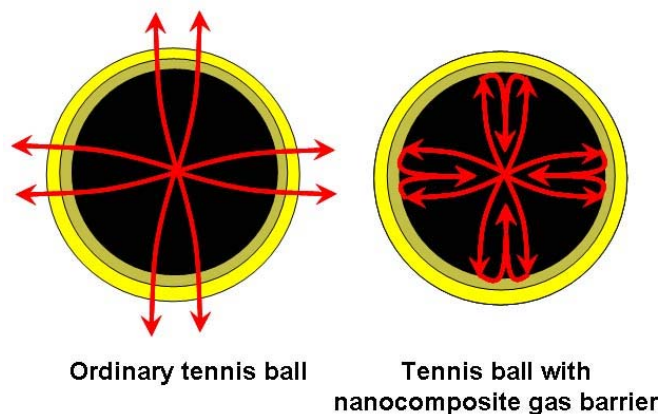


Figure-1 Ordinary tennis ball (left). New Wilson tennis ball coated with gas barrier (right). [2]

The impact of nanotechnology on the level of competitiveness of sports in present times became more evident than ever during the recent 2008 Olympics. American swimmer Michael Phelps was able to obtain eight gold medals while breaking seven world records at the same time. He was accompanied by 25 others who broke world records at these Olympic Games. Though their amazing athleticism cannot be doubted, neither can the effect of their high-tech swimwear on these world record races. Nanotechnology is allowing scientists to create new, ultra-lightweight swimwear that allows the swimmers to practically glide through the water. In fact, testing has shown that the developers have been able to reduce the water absorbed by the new fabrics to only 2% of fabric weight. This is an amazing breakthrough compared to the 50% absorption of previous materials made specifically for low drag swimwear. These new materials also have huge potential in other sports and applications. Because the material rejects moisture, these fabrics can be used to manufacture clothing that repels sweat, leaving the athletes dryer. It can also be used for bicycle riders who wish to cut down on the drag caused by their clothing. [4]

Like swimming, where friction reduction is an important concern, nanotechnology has made its way in to the world of racing. In particular, it has made land speed record setting cars even faster. To prove this, Nanotec-USA applied their Nano-Bionics treatment to the Nish Motor Sports' speed car prior to the Speed Week 2008 at the Bonneville Sand Flats in Utah this year. Despite using a 50% less than usual mixture of Nitro Methane fuel mixture, they were able to obtain a speed that was 37 miles per hour faster than their previous top speed. This state-of-the-art treatment makes any surface that it is applied to ultra smooth. "The self-assembling nano-particles dock directly to the molecules of paint and metal, within the pores of the material. The NanoBionics Smart Particles/molecules self-align themselves, forming new structures." [5] This product also has the beneficial side-effect of making any surface it is applied to much easier to keep clean. Simple soap and water methods of cleaning will keep the surface looking very good. This technology also has great potential in markets such as airliners, automobiles, high speed trains, and watercraft by increasing fuel efficiency due to largely decreased drag. When tested on a commercial aircraft, it was found to decrease fuel consumption by 3%. This will reportedly reduce airliner operational costs by over \$5,000,000.00 a year on fuel alone. [5]



Figure-2 Nish Motor Sports team with their Nano-Bionics treated Streamliner. [5]

Athletic shoes are an interesting product to design because of the fact that they have to be soft in order to absorb the impact of usage, and yet they still have to be hard enough to still maintain their shape and not “deaden out” as they are used. This has been a difficult problem for designers to overcome, but nanotechnology has proven to be useful in solving this problem. The solution to this problem is the shoes are made of a mix of both hard and soft particles. Nanotechnology comes in to play because the particles used are the size of molecules, and it enables the designers to control the mixture. [6] Like the high-tech swimwear, these new nanotechnology shoes have already seen their application in Olympic level competition this past year. Jeremy Wariner, using a new shoe designed specifically for him using nanotechnology by Adidas, was able to win the silver medal in the men’s 400m race. This new shoe “is believed to be one of the most technologically advanced and lightest running shoes to ever hit the track.” [4] The shoe “provides Wariner more stability, comfort, better torsion, safety and increased flexibility while minimizing the energy loss.” [4]



Figure-3 The “Lone Star spike” shoe used by Jeremy Wariner in the 2008 Olympic Games.

Nanotechnology is even giving sports fans the chance to feel an even more intimate connection to the teams they love. Adidas has launched a promotion in New Zealand aimed at involving the fans of the nationally inspiring rugby team, The All Blacks, to an all new level of commitment. Adidas wants to take the names of thousands of the team’s fans, and engrave them on to a single thread that will be used to make one of the jerseys worn by the rugby team. This jersey would then be presented to, and worn by, All Blacks’ team captain Richie McCaw. [7] Along with the fan’s names, the names of all 1073 past and present All Blacks players will be etched on to the thread. The team is also very excited about the idea of having their fans be a part of the team jerseys. Richie McCaw says, “Having the names of fans stitched onto the jerseys provides the players with a further reminded of the public support for the team.” [4]



Figure-4 The Adidas jersey developed for All Blacks Rugby Team

One of the biggest and most universal problems in the sports world is that of smelly gym clothes and sports equipment. Sports equipment is traditionally one of the best breeding grounds for bacteria and fungi that “cause infection, odor, itchiness sores and smelly feet.” [8] If these bacteria and fungi could be kept under control, so could the smell of the clothes and the spread of infections. “Silver has been used for the treatment of medical ailments for over 100 years due to its natural antibacterial and anti fungal properties.” [8] However, incorporating the medical properties of silver in to the equipment has been a challenge. This is where nanotechnology comes in. “NanoHorizons of State College, Pa., this fall said it developed silver nano-particles that can mesh with the cotton, plastic or nylon material in shoes, pads, jerseys, helmets, socks or other pieces of sports equipment.” [3] This is accomplished by making nano-silver particles that typically measure around 25nm. This gives the particles a small volume, but a very large surface area at the same time. The large surface area enables the particles to interact with more bacteria and fungi, which greatly improves its effectiveness in killing them. “The nano-silver suppresses respiration, basal metabolism of electron transfer system, and transport of substrate in the microbial cell membrane.” [8] This process inhibits the multiplication and growth of the bacteria and fungi, therefore leading to much cleaner and better smelling equipment.



Figure-5 A towel treated with SilverSure which is a nano-silver particle treatment that fights bacteria and fungi.

The sport of golf is also impacted by nanotechnology in a similar fashion as tennis. Breakthroughs in the production of lighter, yet strong, composite materials has greatly impacted the design of golf clubs. For example, Wilson is using a nano-composite to replace the titanium crown used on its current golf clubs. The result of this is to lower the weight and center of gravity of the club, thus increasing the power and accuracy potential of the club. In addition, the stronger materials used to produce the shafts used on golf clubs will render them more reliable and increase their service life. The golf balls have also reaped benefits of advances in nanotechnology. [3] The ability to control the production of materials on the molecular level has enabled companies to develop a golf ball that does not suffer from having an uneven spin. This allows for a ball that flies along a much straighter path. [2]

The purpose of this paper was to show only a small portion of the current and possible future applications of developments in nanotechnology. Though none of the topics covered in this paper seem to have an important direct impact on the world, nanotechnology's applications do cover life changing fields such as medicine. To ignore the importance of nanotechnology would be a grave failure of the science world. Nanotechnology will be a very significant branch of research to further improve our society in the future.

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