



FIFA soccer ball  
(Photo: Arkema)

Merquinsa Pearlthane  
ECO used in running shoes  
(Photo: Brooks Sports Inc.)

# Biobased plastic sporting goods

the perfect stepping stone for  
the wide exposure of  
biobased plastics

by

Iris van Wijk

Researcher CleanTech Research Program  
Amsterdam University of Applied Science (HvA)

Amsterdam, The Netherlands

The biobased plastic market is emerging rapidly. New partnerships, pilot plants and production facilities are announced or launched almost every day. Through the high rate of technological development it is still an extremely immature market and biobased plastics need to create wider exposure in higher value goods. Due to good market prerequisites of the sport market, such as high growth rates, high willingness to pay and high material cost-insensitivity, the application of biobased plastics in sporting equipment and apparel is increasing. In addition, a healthy environment is vital to enjoy outdoor sports and brands are offering a lifestyle rather than just a bike or snowboard. Therefore biobased plastic sporting goods are the perfect stepping stone for the wider exposure of biobased plastics to the general public.

## Sport is big business

High growth rates are not uncommon in the sport industry. According to Euromonitor International, the sporting goods market grew by 18% between 2004 and 2009, to an astonishing €104.5 billion. The recession also affected the sports market, but the upcoming London Olympics, the enhanced purchasing power of consumers in Asia, and the increased participation of the middle-aged and kids, is expected to have a buoying effect, acting as a boost to growth in the coming years. In addition, consumers have high willingness to pay premium prices for sporting equipment and apparel as many (semi-) amateur athletes now demand professional sporting gear. Furthermore, according to professor Ashby associated to the Engineering Design Centre and material scientists Johnson, sport equipment is material cost-insensitive. In other words, when material costs double this will increase the product cost only slightly. Therefore sport equipment producers are likely to be inclined to experiment with innovative materials as the smallest performance enhancement may increase the chance to win significantly.

## Sport is naturally allied to a healthy environment

Outdoor sports and the environment are naturally intertwined since we want to breathe in fresh air and enjoy a healthy and inspiring scenery when we exercise. Also sporting products are trendy and feel good products. Brands in the sport industry are not only selling sport equipment and apparel but also a trendy lifestyle that appeals to a lot of people.

## Sport equipment is already using biobased materials

Due to the excellent market prerequisites mentioned, applications of biobased plastics in sport goods is initiated, expanding and improving. For example by Arkema, with their biobased thermoplastic elastomer (TPE) Pebax Rnew. It contains 20%-94% carbon from biobased materials depending on the specific application, and it was used in the Hurricane ski boot of Scarpa and the Renu ski boot of Atomic. Also, the Wave® Technology plates in four models of Mizuno's running shoes and the FIFA soccer ball of Sony are containing Arkema's Pebax Rnew.

Other sport applications used Merquinsa's Pearlthane ECO, a biobased thermoplastic polyurethane (TPU) which contains between 20%-90% cerenol bio-polyol from DuPont. It was used in the Evolve collection of snow goggles of Smith Optics. The high performance Green Silence running shoes and BioMoGo midsoles of Brook Sports. Dupont's Hytrel RS, containing 20%-50% bio-polyol was used in the Ghost skiboots by Salomon.

More recently, the Niche Story Snowboard won the ISPO Award 2012 in the Eco Responsibility | Hardware category and combines Entropy's Super Sap®, a sustainable epoxy together with hemp fibers, FSC wood and recycled material. The ISPO promotes innovations in the sports business and as such hosts multiple sports business events. DSM recently initiated the e-nnovation challenge. In this competition, something suitably innovative for athletes had to be designed with Arnitel® Eco, a biobased thermoplastic copolyester. The competition entries are ranging from a golf glove, a bike seat, a helmet for goal keepers to fishing lures, a sport mattress, walking and climbing gear and even a socket for a prosthetic running leg.

## The sporty way ahead

These examples show that biobased flexible plastics and natural fiber composites are increasing in importance. However, the majority of the biobased polymers used in the bio-TPU and bio-TPE are still drop-ins for synthetic polymers. Furthermore, the application markets were already very familiar with the use of the petro-based version of these materials. To illustrate, due to the material strength and the solubility in a variety of solvents, the main application market of TPE's is the shoe manufacturing industry. Most of the bio-TPE was used in running shoes or ski-boot applications made by companies that originally started as shoe manufacturers. So basically, the familiarity of the particular market with the synthetic variant contributed to the adoption of the partly biobased TPE. Therefore other biobased plastics such as PLA, which is currently the most important thermoplastic biopolymer on the market, is as of yet unexplored as material in sport applications. Nevertheless, market conditions are excellent and today's biobased plastic sporting goods perfectly demonstrate the possibilities and quality of biobased plastics in the most exclusive sporting products that fashionable and sporty consumers demand.



Mizuno running shoe  
(Photo: Arkema)



Snow goggles (Photo: Smith Optics)



Fig. 4: Salomon Ski boots (Photo: DuPont)

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