

Towards the nanotechnology in the footwear sector

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Abstract

The Footwear Technology Center of La Rioja (CTCR), located in the Spanish town of Arnedo (La Rioja), serves as the hub of the sector and the area, providing with its highly qualified staff and excellent facilities, innovative research and development solutions. The Industry of Nanomaterials and Nanotechnology has been growing exponentially continuously, especially in the last 8 years, reaching 2.6 billion dollars in 2014 (5.5 expected for 2016). Within this context, in 2009, the CTCR launched new research into Nanotechnology, incorporating a product line manager, and an analysis and control technician, modifying its laboratories. Since that date, the department has been growing, and nowadays, 5 people contribute to introduce the Nanotechnology into the footwear. The main goal for this new line of development was, and still is, to test new materials from a nanotechnological point of view and apply them in some of the components used in the footwear industry. We can then easily obtain new or better properties, which could increase competitiveness in the regional footwear industry by enhancing and distinguishing their products through the use of new ways of working.

Thus, in the last few years, the CTCR has developed different research projects involving nanotechnology, highlighting:

- Footwear for urban motorcycle drivers: Today, the market offers a wide range of protective clothing for occupants of two-wheeled vehicles, but this offer is especially focused on the professional riders and those who use these vehicles as an element of entertainment, leaving aside the large number of urban and intercity motorists who use the motorcycle or scooter as transportation. In the specific field of protective footwear manufacturers, they are specialists on producing safety shoes that comply with the regulations for use by professional drivers. However, this shoe lacks the necessary degree of comfort and ergonomics for its use spread among the other users. The project allowed the development of a new kind of comfortable shoes for motorists with the especial protection that a nanoparticle-based material confers to the created footwear.
- Bactericide rubber: Poor hygiene and unventilated shoes favor the presence of bacteria such as *Staphylococci* and *aerobic Coreniforme* that grow in the alkaline conditions found in the footwear, and also favored by poor ventilation and moisture. These bacteria grow easily in this medium where dead skin or other organic components are present, exceeding 420,000 colony forming units on average, in a shoe, including *E. coli*, responsible for many intestinal diseases. This high number of bacteria, besides being a health problem, is also responsible for the appearance of unpleasant odors due to the formation of several volatile chemicals. The footwear industry is committed to highest quality materials and design. The introduction of nanoparticles before the vulcanization process, allows obtaining bactericide soles, tested against the most commonly found bacteria in footwear.
- Reduction of vulcanization time: One of the main chemical reactions in the footwear sector is the vulcanization process, which allows a rubber to show adequate physical properties to be used as soles. By using nanoparticles, now it is possible to reduce the vulcanization time up to a 40%, which represents a money saving and allows an increment in the shoe production.

Figures

