THE INFLUENCE OF FOOTWEAR UPPER MATERIALS ON INNER MICROCLIMATE

Zbigniew Mikołajczyk[1], Bogusław Woźniak[2], Nataliia Popovych[3]
[1]Technical University Lodz, Poland, [2]Ogólnopolska Izba Branży Skórzanej, Poland
[3]Lviv University of Trade and Economics, Ukraine
popovych.n1988@gmail.com, bowo@go2.pl

The comfort of using footwear is one of the important factors determining the quality, functionality and usefulness of the product. The concept of comfort (or discomfort) in the use of footwear is difficult to define, its assessment is basically based on the subjective feelings of users. It is assumed that the basic cause of discomfort is too much pressure exerted by the upper and bottom on the user's legs or excessive humidity and temperature inside the footwear. Mechanical comfort (wearing comfort of footwear, its fit) is the subjective assessment of the user, while in the case of thermal comfort, it is necessary to characterize the microclimate inside the footwear during its use. The microclimate in footwear and its hygiene are determined by the temperature and relative humidity inside the footwear during its use [1].

The foot is one of the parts of the human body that does not maintain constant temperature. The temperature in the footwear microclimate, which is most comfortable for the user, ranges from 28 to 34 ^{o}C . The relative humidity should, however, be maintained at the level of 60 to 65% [2]. The aim of the work was to develop hybrid technology for the outer part of textile footwear (uppers), along with the modeling of functional comfort in terms of thermal and physiology. The partial goal of hybrid technology combines 2D and 3D knitting technology with the embroidery technique. The created multilayer material package of the uppers as well as its components were subjected to functional tests of thermo-physiological comfort. In the design of footwear, it was decided to use a multi-layer system of materials by combining synthetic and natural materials, following the canon of construction of a two-layer knit with increased biophysical values [3]. According to this canon, a polyester spacer knitted fabric with hydrophobic properties (i.e., low moisture absorption rate), constitutes the footwear lining, that is, the conductive diffusion layer adjacent directly to the body. The moisture appearing inside the footwear is transferred to the next sorption layer with hydrophilic properties, made of cotton knitted fabric, which is excluded from direct contact with the user's skin. The adopted material design ensures an appropriate microclimate inside the footwear. The structure of the spacer knitted fabric, which consists of two different outer layers (smooth and openwork) connected by a monofilament layer also contributes to the increased physiological and hygienic comfort. The smooth layer is directed toward the cotton fabric, while the openwork is in contact with the foot. The 3D knitted fabrics provides very good air permeability and minimal absorption of moisture and water. Its porous structure in direct contact with the skin allows for air access to the foot, improving the ventilation of the footwear. In order to give the footwear additional cushioning properties and air pumping function, knitted fabric with a structure different from that of the lining can also be used as an insert. The 3D knitted layer also minimizes the growth of bacteria and mites.

The results shows, that the distance knitted fabric can be an excellent material for whole shoe uppers or elements of the uppers.

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