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Topic of the Speech:
Heat Retention of Fabrics Composed of Moisture-absorbing Heat-generating Fibers and Wear Comfort

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She is interested in the effects of functional fibers on the human body, related to odors and deodorant fibers, antibacterial fibers and itchy of skin, etc.

ABSTRACT SUBMISSION
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Heat Retention of Fabrics Composed of Moisture-absorbing Heat-generating Fibers and Wear Comfort

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ABSTRACT

A recent Japanese Industrial Standard (JIS) specifies the hygroscopic and exothermic characteristics of the textile products composed of moisture-absorbing heat-generating fibers in terms of two parameters of the maximum generated hygroscopic heat temperature (ΔT_{max}) and the heat keeping index I_{hk} defined as the area of the temperature decay curve simulated by a Newtonian exponential regression curve from ΔT_{max} to its half decay period. Those textile products are popular items in the cold weather, but the JIS specification does not necessarily guarantee the wear comfort for the consumers. The present study intends to assess their wear comfort by the subjective test with the reference of the JIS specifications for moisture-absorbing heat-generating fibers monitored by the in-cloth temperature and moisture.

Two commercial products of hygroscopic and exothermic inner wears were submitted to the subjective wearing tests, where the products were composed of (1) acrylic/cellulosic-based fibers and (2) acrylate-based fibers, respectively. As a reference, a commercial cotton inner (3) was adapted because by considering its high ΔT_{max} although it is not specified as a moisture-absorbing heat-generating product. The subjects wore these sample inners, and were asked to repeat a routine exercise cycle of rest (5min) – exercise (10min) – rest (5min) – exercise (10min) –rest (10min) under the environmental conditions of winter (15°C, 60% RH). The subjective test confirmed that the acrylate-based inner wear (2) exhibited a higher in-cloth temperature than other inner wears (1) and (3), and the participants could feel it warm immediately after wearing.

The in-cloth temperature increases during a routine exercise and maintains in the range of 0.5°C because of the hygroscopic heat generation, while the in-cloth humidity stays relatively invariant around 50 %. The acrylate-based product (2) exhibited the highest in-cloth temperature as ΔT_{max} was the highest, followed by the acrylic/cellulosic-based product. Although ΔT_{max} of cotton is second high (higher than the acrylic/cellulosic-based product), the in-cloth temperature was found considerably lower than other products, and the subjects felt cold and uncomfortable during resting periods by wearing the cotton inner, probably due to its hydrophilicity and high percentage of water retention as well as the fabric structure. So-called moisture-absorbing heat-generating fabrics have more air holes for insulation and the surface is covered by fairy hydrophobic polyester fibres preventing skin from touching wet part, whereas the cotton inner is tightly knitted and its wet surface may touch skin directly.