

Breathability and Thermal Insulation Performance of an Arctic Fox Fur used for Clothing in North Greenland

Ryo Kusaka¹, Shin Sugiyama¹ and Aki Harada²

¹Hokkaido University

² Natural Energy Research Association in Hokkaido

Traditional fur clothing is still used in North Greenland. The superiority of fur clothing in the polar regions has been widely recognized, but there are few examples of quantitative evaluation of its performance. Experience has shown that fur clothing is superior to down jackets in terms of breathability and thermal insulation, which are important for long-term hunting in the cold season. Nowadays, even in North Greenland, light and warm clothing such as down jackets is easily available, but still many people love and wear traditional fur clothing. In this study, we made a comparative experiment on the breathability and thermal insulation performance of an arctic fox fur and a down quilt, which are used in the coldest season in North Greenland. Figure 1 shows the experimental apparatus of the breathability test. In this test, the water temperature in the container was kept at 35 ° C, and the container covered with the fur clothing. Table 1 shows the amount of water absorption, amount of water vapor transmission, and water vapor transmission rate of the fur clothing and the down quilt. Fur absorbed only about half of water absorption by the down quilt, and showed a three times greater water vapor transmission rate. The results of the insulation test are shown in the figure 2. It was found that both the fur and the down quilt had almost the same thermal insulation performance as the water temperature dropped to about 18 ° C in 3 hours. We attribute the better breathability of fur to the difference in the material structures. As shown in figure 2, the dew point usually exists in the temperature gradients within the materials. This results in condensation of water in the test piece. In contrast to water vapor trapped and condensed between cover cloths of a down jacket, fur is able to releases water vapor out of the material [Figure 2].



Figure 1. Experimental apparatus of the breathability test.

Table 1. Breathability of fur clothing and down quilt.

	fur clothing	down quilt
amount of water absorption [g]	0.45	0.89
amount of water vapor transmission [g]	2.50	0.68
water vapor transmission rate [$\text{mg cm}^{-2} \text{hr}^{-1}$]	31.9	11.5

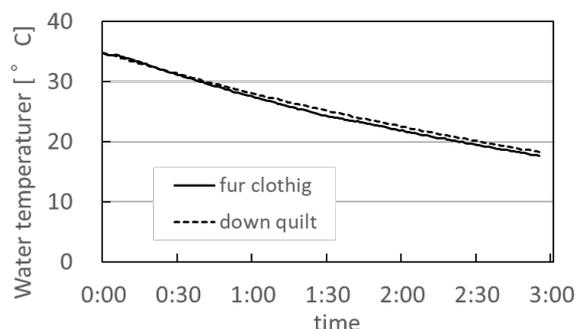


Figure 2. Water temperature in a beaker covered with fur clothing and down quilt.

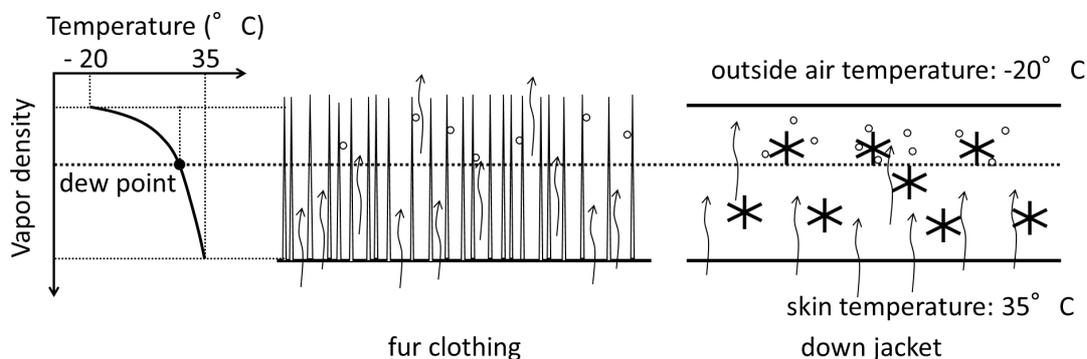


Figure 2. Conceptual diagram of water vapor movement and condensation of fur clothing and down jacket.

References

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