

Thermoregulatory Photonic Fabric for Personal Thermal Management

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Abstract

Clothing is an essential part of our daily life in order to satisfy the thermal comfort of the human body. However, conventional clothing generally exhibits poor thermal performance and low means of control. Indeed, a sudden change in room temperature considerably affects the thermal comfort of the body. Hence the need for continuous use of heating, ventilation, and air conditioning (HVAC) systems in indoor areas, to maintain an appropriate thermal environment of the room. However, this solution clearly shows its limitations by the huge energy consumption implied which affects the sectors of economy, energy, and environment. Therefore, the development of new textiles able to manage the temperature of the human body close to the skin over a wide range of ambient temperatures, without additional energy input, appears to be an urgently needed alternative solution.

At normal skin temperature (34°C), the human body emits electromagnetic waves in the mid-infrared range with an emission peak at a wavelength of 9.5 μm . These thermal radiations are responsible for more than 50% of heat loss for the human body [1].

Recent progress in the field of heat applied to textiles has shown that modulation of the infrared radiation emitted by the human body enables to acquire heating or cooling properties [2–4]. To date, the maintain of thermal comfort, passively, with the same textile represents a challenge for the scientific community.

References

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