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Evaporative Cooling Garment Featuring Collapsible Sun and Wind Shades

Background

As heatwaves become more frequent and intense, personal cooling becomes increasingly important for sustaining outdoor activities and for individuals without access to air conditioning. For about one-third of the current global population living in dry lands, evaporating water from clothing is the simplest, safest, most cost-effective, and lightest weight method of augmenting natural thermoregulation. To cool off, one can simply wear a water-soaked cotton shirt or a highly water-absorbing commercial cooling garment. However, if such apparel is exposed to solar radiation or even slow air flow, water evaporation is accelerated which diminishes cooling capacity.

Invention Description

Research at Arizona State University has led to the development of an evaporative cooling garment featuring collapsible sun and wind shading elements over the surface of the garment. The geometrical and radiative properties of the shading elements have been described and analyzed. For a wearer who is not moving and in stagnant conditions, the water usage efficiency—and thus cooling capability—is optimized by introducing a ventilation gap between the wet garment surface and the shading elements. In contrast, for a wearer who is moving or exposed to wind, such a gap results in excessive evaporation rates that are dependent on the wind speed. A perforated reflective shade design with a collapsible ventilation gap can provide a moderate cooling rate that is nearly independent of sun and wind effects. For a high wearer exertion rate, the evaporative garment may also provide a higher cooling rate by maintaining the gap. The evaporative cooling garment can minimize the weight of the garment, increase its length of cooling, or both.

Potential Applications

- Evaporative cooling garments (especially for arid climates)
- Outdoor and athletic wear

Benefits and Advantages

- Enhances cooling capability by restricting exposure of wet sublayer to sun and wind
- Cost effective
- Lightweight
- Simple to fabricate

Related Publication: [Rational design of sun and wind shaded evaporative cooling vests for enhanced personal cooling in hot and dry climates](#)

[Faculty Profile of Professor Konrad Rykaczewski](#)