

“Natural-skin” - Color Bionics and Thermal Comfort in Textiles and Apparel Technology

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Abstract: A Biomimetic Natural-skin Fabric is developed under biomimetic methods, inspired by the connection between color and temperature regulation mechanisms in typical animals, such as Namibian chameleons, Sahara silver ants polar bears, and so on, to assist Personal Wearable Thermal Management (PTMS). In the face of climate change and energy problems, humans can keep summer cool and winter warm through heating, ventilation, and air conditioning (HVAC) systems under indoor conditions, but there is no efficient and sustainable temperature regulation mechanism in outdoor activities. [1] A series of thermoregulatory methods of different animals in extreme environments, based on comparative biology theory, review their similarities and differences and guide the research and design of PTMS through biomimetic theory. The microstructure and dynamic adaptability of some animal epidermis, show high adaptability to temperature, which can change in different external environments. This paper summarizes the high adaptability of some typical organisms under certain high/low temperature or extreme temperature changes, guiding the design of outdoor personal wearable thermal management textiles.

Keywords: biomimicry, colour science, bionic technology, radiation cooling, wearable thermal management.

Table 1 The relationship between radiation and colouration

Name	The relationship of radiation and colouration		
	Type of Colour	Colour	Radiation
Saharan silver ants [2]	Structural colour	Silver	High Reflectivity
Silver fox	Structural colour	Silver	High Reflectivity
Polar bears [3]	Structural colour	White	High Reflectivity
Longicorn beetles [4, 5]	Structural colour	Black brown	High Absorptivity
Morpho didius butterfly of Peru [6, 7]	Structural colour & pigment	Blue	High Reflectivity
Namibian chameleon [8]	Photonic crystal	adaptive colour	High Absorptivity & Reflectivity

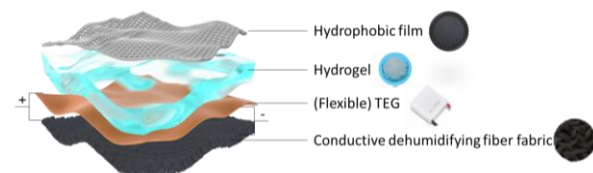


Figure 1 Biomimetic Natural-skin Fabrics

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