Department of Biomedical Engineering
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Research Student Seminar Series

Toward low-emissivity passive heating: a supramolecular-enhanced membrane with warmth retention

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Supervisor: Prof. Jinlian Hu

Date: 22 November 2024
Time: 5:00 pm - 5:30 pm
Venue: ZOOM Online

Abstract

Maintaining a reasonably stable body temperature is vital for a variety of human activities in an energy-conservation strategy. However, it is well-known that metal-like materials, utilized as radiative reflectors, severely restrict wearability properties, thus posing a tremendous obstacle in personal thermal management systems. Herein, we designed a supramolecular-enhanced membrane (SupraEM) acting as a mid-infrared reflector to solve the conundrum of warmth-wearability performance. Benefiting from the low-emissivity of decorating titanium carbide (MXene, a kind of typical 2D material) and the formation of supramolecular interactions, the prototyped polyvinylidene difluoride&Polyurethane/ MXene (PVDF&PU/MXene) SupraEM demonstrated a low-emissivity of 0.246 and reinforced mechanical performance, resulting in an evenly higher temperature retention of 8 ˚C in comparison to the pristine hybrid membrane counterpart, and compared with a commercial textile that is three times thicker, it also exhibited higher temperature retention of 6.2 ˚C. This work demonstrates the wearability of decorated MXene without sacrificing its temperature retention, overcoming a major bottleneck that has plagued MXene as a thermoregulatory material for PTM systems.

Biography

LEI Leqi is now pursuing a Ph.D. degree in Prof. Jinlian Hu's group with the Department of Biomedical Engineering, City University of Hong Kong. Her research interests include electrospun membranes, thermal management textiles, and radiative cooling materials.

ALL are Welcome!