Flexible self-adaptive thermal radiators using infrared thermochromic antennas

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Passive thermoregulation is the ability of living organisms to maintain their internal body temperature against the thermal fluctuations of the surroundings. Imitating this mechanism artificially in elements for buildings, cars, or clothing, could enable significant reductions of the energy demand for heating and cooling systems [1–7]. In this talk, I will introduce our work on infrared thermochromic antennas for self-regulated modulation of radiative heat losses. The antennas are featured by VO2 microcrystals grown by hydrothermal synthesis, which are designed to dramatically switch its thermal emissivity across VO_2's phase-transition temperature (70° C) [8], at specific regions of the infrared spectrum that can be tuned at will. By embedding the thermochromic antennas into an infrared-transparent polymer, we demonstrate a versatile and cost-effective manufacturing technique for self-adaptive thermal radiators, opening new pathways for large-scale fabrication of passive thermoregulation paints, fabrics, and films.

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