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Abstract

Infrared Management in Nature and Bioinspired Applications [†]

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The regulation of body temperature and the mastery of thermal radiation control stand as fundamental survival mechanisms for diverse animal species. Evolution over millions of years has fine-tuned natural systems, particularly in cold-blooded organisms like insects, as well as those facing extreme temperature conditions, such as polar bears, Arctic foxes, and dromedaries. These creatures have developed unique integumentary features to optimize thermal radiation absorption and regulation [1]. This conference contribution investigates selected natural case studies, focusing on the intricate designs found in butterfly wings and animal furs. These natural structures, honed by evolution, serve as a spring of inspiration for developing innovative materials with enhanced energy efficiency for infrared absorption and thermal insulation. By examining the biological adaptations that enable these organisms to excel in thermal regulation, we can draw insights to inform the design, development, and fabrication of materials that mimic these features [2]. Through the exploration of bioinspired applications, this presentation will underscore the potential for translating biological principles into practical solutions. By bridging the realms of biology and materials science, attendees will gain a deeper understanding of how nature's innovations can guide the creation of advanced structures capable of efficient thermal management. This interdisciplinary approach holds promise for applications in diverse fields contributing to the development of sustainable and energy-efficient solutions.

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