

This review introduces three innovative devices: the energy-free thermostat, the negative-energy thermostat, and the multi-temperature maintenance container. All are grounded in the principles of ...

Herein, we introduce tunable thermal metamaterials that use the assembly of unit-cell thermal shifters for a remarkable enhancement in multifunctionality as well as manufacturability.

In this paper, we review and summarize the recent progress, and outlook, of thermal metamaterials as related to challenges in thermal management of electronic packaging. In Sec. 2, we ...

Moreover, the dynamic thermal metamaterials allow accurate control at both time and space dimensions, leading to exciting applications such as adjustable, reconfigurable, and intelligent ...

These two materials not only have excellent thermal stability and mechanical properties but are also widely available and low-cost, providing feasibility for lower production costs and large ...

In this review, we focus on the topology optimization methods for thermal metamaterials, which are summarized into three categories: heat-flux driven, temperature-field driven, and thermal ...

In this work, a tandem grating solar absorber is proposed, which can be easily fabricated on a wafer scale and is thermally stable up to 800 K. The base of the solar thermal absorber consists of a ...

We have identified scenarios where thermal metamaterials enable the generation of much larger temperature gradients compared to the classical Fourier approach, offering insights into ...

Abstract Low-cost and large-area solar-thermal absorbers with superior spectral selectivity and excellent thermal stability are vital for efficient and large-scale solar-thermal ...

Maintaining temperature is crucial in both daily life and industrial settings, ensuring human comfort and device functionality. In the quest for energy conservation and emission reduction, several ...

They are often simply called thermal metamaterials, but in this Review we use this term to refer to all kinds of metamaterials for heat transfer control, including the nanophononic and...

Based on experimental analysis, it has been observed that diverse photonic structures and metamaterials manipulate the solar reflection and thermal emission for daytime radiative cooling. One ...

SUMMARY Thermal metamaterials have amazing properties in heat transfer beyond naturally occurring

Thermal solar container metamaterials

materials owing to their well-designed artificial structures. The idea of thermal metamaterial has ...

The visibly clear metamaterials deployed in solar cells and windows can effectively suppress the rise in temperature under solar irradiation, thereby mitigating the performance degradation of solar cells by ...

When compared with traditional technologies, the unparalleled efficacy of thermal metamaterials in temperature management is evident. Moreover, brief prospects present strategies to improve ...

??? ?????? ?? Visibly Clear Radiative Cooling Metamaterials for Enhanced Thermal Management in Solar Cells and Windows ?????????????????????? ...

In this perspective, we review the up-to-date progress of thermal metamaterials start-ing from 2008. We focus on both the key theoretical fundamentals and tech-niques for applications and give a ...



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