

Enhanced Radiative Cooling for Power Equipment

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ABSTRACT: While providing electrical energy for human society, power equipment also consumes electricity and generate heat. Cooling equipment significantly increases electricity consumption and strains the power grid. Therefore, developing low-energy and sustainable cooling technologies for power equipment is critical. This study presents a hybrid passive cooling composite designed to enhance heat dissipation for heavy-load power devices. The composite boasts an impressive average solar reflectance of 0.98, ensuring effective radiative cooling. Its excellent atmospheric water harvesting capability allows for substantial evaporation cooling without manual water replenishment. Consequently, the composite reduces the temperature of outdoor heavy-load equipment, such as transformers, by 25.3 °C. Its superior heat dissipation properties make it an invaluable solution for protecting electrical systems.

KEY WORDS

Thermal management; metal-organic frameworks; radiative cooling; sorption-based evaporative cooling