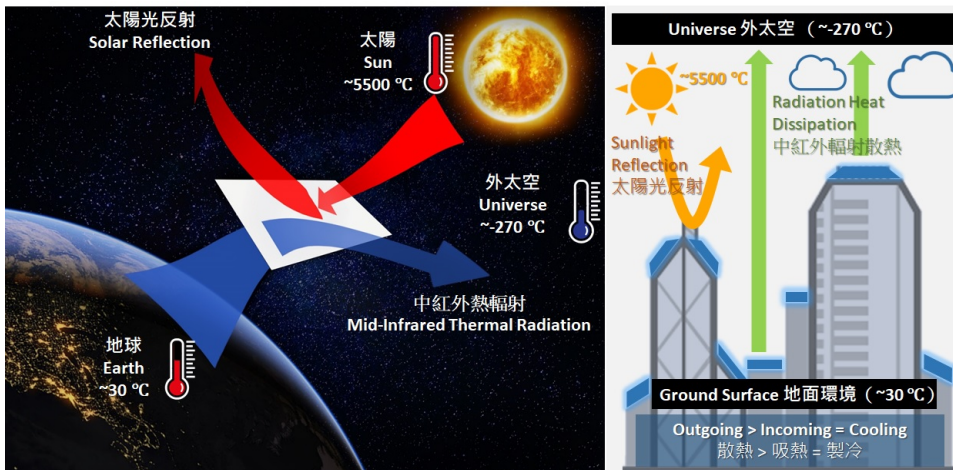


An Energy-Free, Low-Cost and High Cooling Performance Passive Radiative Cooling Technology for Building Applications

Energy & Environment

Buildings and Construction Technology



Remarks

1. Inventions Geneva Evaluation Days (IGED) 2021 - Congratulation with Jury
2. 3rd Asia Exhibition of Innovations & Inventions Hong Kong (AEII) (2023) - Gold Award

IP Status

Patent granted



Opportunity

Hong Kong has more than 50,000 buildings, and cooling those buildings consumes about 30% of Hong Kong's total energy, leading to an enormous market for passive radiative cooling paint (PRCP), a novel energy-saving cooling technology that can be used in buildings. Besides the building sectors, there is also a great market potential in the painting industry for PRCP. According to the data from the World Paint and Coatings Industry Association in 2019, the global paint market sales were US\$172.8 billion. All these figures indicate the huge and diverse opportunities for PRCP. Overall, PRCP possesses many advantages: simple manufacturing process, low-cost, environmentally friendliness, nontoxicity, odorless, energy-saving potential, high adaptability, and high cooling efficiency, attracting great attention from various industries.

Technology

Passive radiative cooling paint (PRCP), an emerging applied Nano-material technology that can block the incoming solar irradiance from the sun, while simultaneously creating a cooling effect by emitting thermal radiation to the cold universe (~3 K). Hence, sub-ambient cooling can be achieved even under direct sunlight. Different from conventional cooling technologies, PRCP leads the way to eco-friendly and energy-free cooling without causing ozone depletion and greenhouse effect. Based on the results of our PRCP, by applying this cooling technology on a building rooftop, the rooftop temperature can be reduced by 15 °C under direct sunlight when it is compared to the rooftop without coating the PRCP, saving about 10% of cooling energy of traditional air-conditioning systems in buildings.

Technology Readiness Level (TRL) ?

7

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Develop Concept

Proof Concept

Funding

Build Value

Advantages

- Electricity-free and Energy-efficient: the operation of PRCP does not require electricity input and the cooling performance of PRCP is high;
- Easy to make: the manufacturing of PRCP is time-efficient and straightforward;
- Low-cost: the cost of PRCP is low;
- Environmentally friendly, Non-toxic, and Odorless: the PRCP does not generate pollutants during the operation;
- Highly adaptable: the applications of PRCP are broad.

Applications

- Buildings/automobiles: integration of PRCP for pre-cooling purposes to reduce energy consumed by traditional air-conditioning systems;
- Thermal management of solar cells to enhance its power conversion efficiency;
- Thermal management of outdoor electronic devices to improve electricity utilization efficiency;
- Heat island effect mitigation by coating PRCP on the roads and other infrastructures in urban areas;
- Self-cooling merchandise by coating PRCP on the outer layer of umbrellas/hats/textiles.

