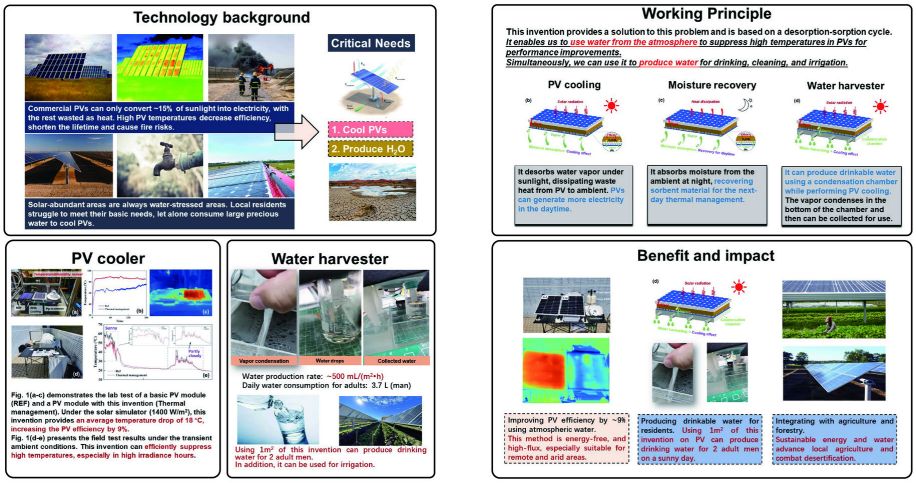
Knowledge Transfer Office
香港城市大學
City University of Hong Kong

Energy-free PV Cooler and Water Harvester

Energy & Environment

Energy Conservation/Generation/Management/Storage (Battery)



Remarks

48th International Exhibition of Inventions Geneva (IEIG) (2023) - Gold Medal

IP Status

Patent filed

Technology Readiness Level (TRL) ? 6

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Opportunity

Commercial Photovoltaics (PV) can only convert ~15% of sunlight into electricity, with the rest wasted as heat. The resulting high PV temperatures decrease the efficiency, shorten the lifetime, and cause fire risks, thus should be suppressed. However, existing PV thermal management relies on either some active system designs with high energy/water consumption or passive designs with low cooling powers, which exhibits low practicability to solve this problem. In addition, solar-abundant areas usually face water scarcity problems. Residents struggle to meet their daily needs, let alone use water to cool PV. These dilemmas call for innovation to address PV thermal management in a high-flux, energy-free, and water-free way.

Technology

This invention provides high-flux passive cooling for the thermal management of PV via a moisture desorption-absorption process without energy consumption. It desorbs water vapor under sunlight, dissipating waste heat from PV to ambient. It absorbs moisture from the ambient at night, recovering sorbent material for the next-day cooling. The desorbed vapor can be condensed for drinking, irrigating, and PV cleaning. This invention can promote the development of efficient, reliable, and versatile solar power technologies.

Advantages

- High flux cooling via moisture desorption and evaporation
- Energy-free and self-recovery
- High water yield

- Low-cost raw material and facile fabrication

Applications

- PV plant thermal management
- Remote and off-grid area energy and water production
- Support farming and forestry in the arid area