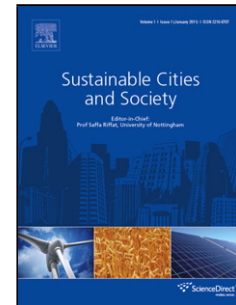


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Integrating photovoltaic thermal collectors and thermal energy storage systems using phase change materials with rotary desiccant cooling systems

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Highlights

- The use of a PVT-SAH and a PCM TES unit to regenerate a desiccant wheel was studied
- The PCM TES unit was used to solve the mismatch between energy demand and supply
- Response surface method was used to find an optimal design of the proposed system
- The feasibility study was performed under three regeneration temperatures
- Outlet air temperature of the PVT-SAH directly impacts the selection of PCM types

Abstract: This paper presents a feasibility investigation of integrating a hybrid photovoltaic thermal collector-solar air heater (PVT-SAH) and an air-based thermal energy storage (TES) system using phase change materials (PCMs) with rotary desiccant cooling systems for residential applications. The PVT-SAH is used to generate both electricity and thermal energy, while the TES unit is used to solve the mismatch between energy demand for desiccant wheel regeneration and thermal energy generation from the PVT-SAH. A near-optimal design of the proposed system is first identified using the response surface method. The feasibility is then examined using three performance indicators, including Solar Thermal Contribution (STC), Supply Air Temperature Unsatisfied (SATU) factor and Supply Air Humidity Ratio Unsatisfied

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