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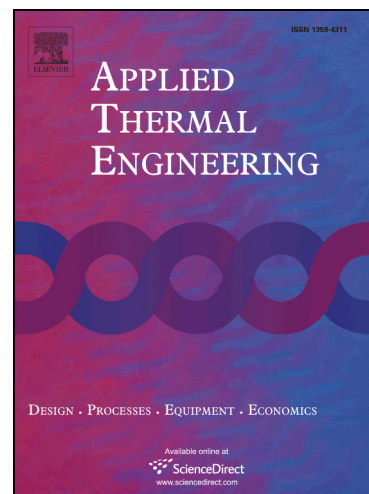
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Development and Demonstration of a Compact Ammonia-Water Absorption Heat Pump Prototype with Microscale Features for Space-Conditioning Applications

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ABSTRACT

This paper presents the development and demonstration of a compact packaged prototype of a single-effect ammonia-water absorption cooling system with a nominal cooling capacity of 3.5 kW. The packaged unit encompasses a combustion module to supply thermal energy to the system where heat is exchanged between combusted gas and a heat transfer fluid. The heat transfer fluid provides heat to the desorber where refrigerant is generated. The heat and mass exchange components of the absorption system are integrated into two monolithic blocks. The sub-components of each monolith utilize microscale heat and mass transfer passages, which have higher heat and mass transfer coefficients compared to conventional designs, resulting in substantial reductions in the required size of the system. Semi-autonomous control algorithms are developed to enable stand-alone operation of the packaged unit. System performance is measured over a range of operating conditions and compared with predictions of the corresponding system model.

KEYWORDS

Absorption; microscale; ammonia-water; heat and mass exchangers; heat pump; prototype

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