

Thermoelectric Air-Conditioning System: Building Applications and Enhancement Techniques

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ABSTRACT

The high reliability, the absence of working fluid and auxiliary pipes in the thermoelectric cooling application have attracted the attention of researchers in the last two decades. However, the use of thermoelectric air-conditioning system for building application has not been entirely explored due to its low coefficient of performance (COP) compared to the conventional air conditioning system. To overcome this primary limitation, different COP enhancement techniques of thermoelectric for air conditioning system building application are made available. This paper provides the recent development of thermoelectric air conditioning system in building applications, such as thermoelectric radiant panel ceiling, thermoelectric air duct system and thermoelectric cooling facades. It also provides the different strategies to enhance its performance in order to fit this technology in real building applications such as the integration of water-cooling system, phase change materials, evaporator cooling system and nanofluid micro-channel heat sinks. Lastly, the challenges of thermoelectric air-conditioning systems and future research directions are discussed.

KEYWORDS

Air conditioning; performance enhancement; thermoelectric; thermal management

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