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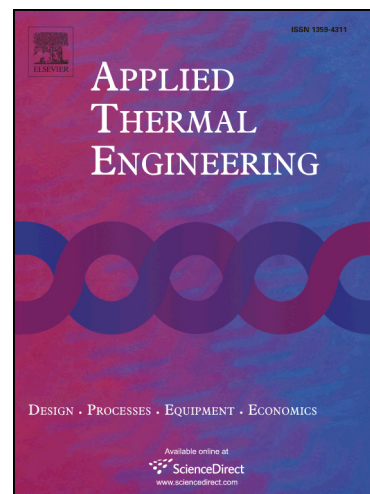
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Photovoltaic capacitive deionization regeneration method for liquid desiccant cooling system

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Abstract

Liquid desiccant cooling system (LDCS) is an ideal choice as a green air-conditioning system. However, its performance is not good enough because a lot of energy is wasted in the conventional thermal regeneration process. Moreover, the system is unstable when the environmental humidity is high. To improve, a capacitive deionization regeneration method is proposed: Driven by solar photovoltaic generator, strong desiccant are acquired in an electric field with capacitive deionization units. It avoids the energy waste in the conventional pattern and has a better performance. Theoretical and experimental researches are presented. Mass and energy models have been developed and some important parameters have been investigated. Performance comparison has been made between the new method and solar thermal regeneration method. Preliminary tests have been made on the regeneration process. Through analysis, it exposes the influences of the solution concentration, voltage and energy recovery ratio. The highest COP can attain 6 under certain working conditions. The experimental results show the actual performance is higher in the lower concentration range. Compared to the solar thermal method, the new method could have better performance and is potential for application.

Keywords: Liquid desiccant cooling system ; Regeneration; Capacitive deionization; Performance

1. Introduction

Seeking a comfortable living condition is a popular trend today, which leads to the wide use of the air-conditioning systems. To build a greener society, it would be favourable to make the air-conditioning system more energy efficient and environmental friendly [1-3]. In this sense, liquid desiccant cooling system (LDCS) could be a better alternative to the widely used vapor compression system, as it can make good use of kinds of renewable energies and is environmental friendly [4-6].

The present universal regeneration manner of LDCS is a thermal energy (TH) style . Utilizing solar energy for regenerating dilute desiccant solution has been getting a great deal of consideration recently [7, 8]. However, the poor performance of LDCS is the bottleneck for its development [9-12].

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