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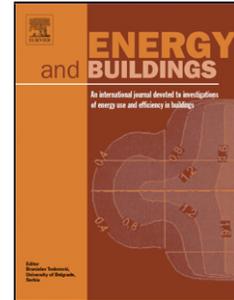
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# An Experimental Study of a Novel Integrated Desiccant Air Conditioning System for Building Applications

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## Abstract

To date, the application of liquid desiccant air conditioning systems in built environment applications, particularly small scale, has been limited. This is primarily due to large system size and complexity, issues of desiccant solution leakage and carry-over and equipment corrosion. As a result, a novel integrated desiccant air conditioning system (IDCS) has been developed. The system combines the regenerator, dehumidifier and evaporative inter-cooler into a single membrane based heat and mass exchanger. This paper presents an evaluation, based on experimental data, of the novel IDCS operating with a potassium formate ( $\text{CHKO}_2$ ) desiccant working fluid. A range of tests have been completed to characterise the performance of the dehumidifier, regenerator and complete IDCS. Cooling output in the range of 570 to 1362W and dehumidifier effectiveness in the range of 30 to 47% are presented. An issue encountered has been an imbalance between moisture removal rate in the dehumidifier and moisture addition rate in the regenerator. As a result, an adjusted thermal COP ( $\text{COP}_{\text{th,adj}}$ ) value has been calculated.  $\text{COP}_{\text{th,adj}}$  values of 1.26 have been achieved with an average of 0.72. Electrical COP ( $\text{COP}_{\text{el}}$ ) values of 3.67 have been achieved with an average of 2.5.

The work demonstrates that the novel IDCS concept is viable and has provided progress to the field of liquid desiccant air conditioning technology for building applications. Further work is required in order to address the main issue of mass imbalance between the dehumidifier and regenerator.

**Keywords:** Liquid desiccant, air conditioning, integrated design, building application, potassium formate.

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