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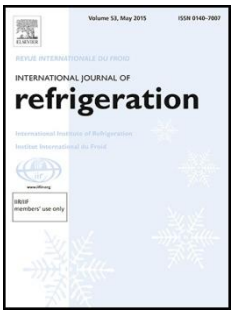

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Experimental study and performance predication of carbon based composite desiccants for desiccant coated heat exchangers

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Highlights

- Composite desiccant were prepared for desiccant coated heat exchanger (DCHE)
- Texture properties of composite samples were different from pure hosts
- Composite desiccants had enhanced sorption kinetics and isotherms
- Enhanced dehumidification capacity was evaluated using composite materials in DCHE

Abstract:

A DCHE (desiccant coated heat exchanger) is a novel solid desiccant cooling component with desiccant coated onto the surface of a fin-tube heat exchanger. In the paper, carbon based composite desiccants were developed and studied for DCHE systems. Composite desiccants were fabricated by impregnating LiCl into pores of activated carbon and activated carbon fiber. Due to impregnated salt, composite desiccants were found to have smaller surface area and pore volume. Sorption isotherms were measured and simulated based on Polanyi potential theory. Water sorption isotherms showed that composite desiccants possessed enhanced sorption quantity. Sorption kinetics was also investigated and fitted with the linear driving model. Composite desiccants showed higher dynamic water uptakes and reasonable rate coefficients. Finally, to predict dehumidification performance of composite desiccants in DCHE systems, a mathematical model was built. Simulation results showed that composite desiccant coated DCHEs can remove more moisture from the process air.

Keywords: Composite Desiccant; Desiccant coated heat exchanger; Sorption isotherm; Sorption kinetics; Dehumidification evaluation

Nomenclature

c	Fitting coefficient of linear equation