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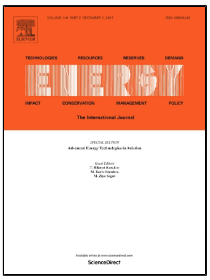

Impact of adsorbent characteristics on performance of solid desiccant wheel

K.F. Fong, C.K. Lee

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Impact of adsorbent characteristics on performance of solid desiccant wheel

K.F. Fong*, C.K. Lee

Division of Building Science and Technology, City University of Hong Kong, Tat Chee Avenue, Kowloon, Hong Kong, China

*Corresponding author.
Tel: 852-3442-8724, fax: 852-3442-0443
Email address: bssquare@cityu.edu.hk
Post address: Tat Chee Avenue, Kowloon, Hong Kong, China

Abstract

This study was to investigate the impact of the characteristics of adsorbents on the performance of the desiccant wheel. Since the physical parameters of different wheels are not identical, the measured results would not truly reflect the sole influence of the adsorbents. As such, the performances of the desiccant wheels using RD silica gel (SG), AQSOA-Z02 and CECA-3A were compared through computer modeling. The variation of the absorbent condition through the entire cyclic humidification/dehumidification process was evaluated in order to review the role of adsorption isotherms. With the ambient humidity ratio of 16.04 g/kg, the desiccant wheel using SG, AQSOA-Z02 and CECA-3A would decrease the humidity ratio of the process air by 33.0%, 22.6% and 18.7% respectively at the regeneration temperature of 50 °C; while further by 65.2%, 64.5% and 51.1% respectively at 90 °C. Although AQSOA-Z02 was presented to have higher dehumidification capability from the adsorption isotherms, it was found that the desiccant wheel using SG would generally have better performances due to its lower heat of adsorption. CECA-3A was evaluated to have the lowest dehumidification capability because of narrow moisture uptake range. As a result, it is essential to appraise the adsorbent performance in a holistic approach.

Keywords: Solid desiccant wheel; adsorbent; moisture uptake; heat of adsorption; desiccant dehumidification.