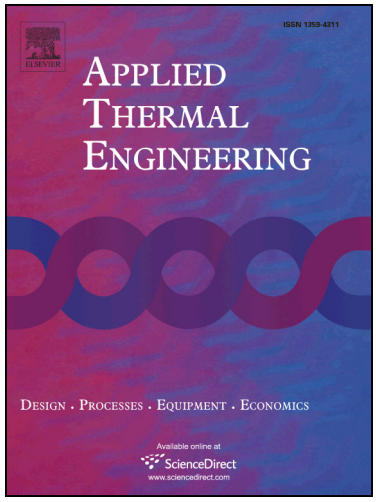

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NH_2-MIL-125 AS PROMISING ADSORBENT FOR ADSORPTIVE COOLING: WATER ADSORPTION DYNAMICS

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Abstract. Adsorption heat transformation (AHT) has attracted an increasing research interest as energy saving and environmentally benign alternative to vapor compression systems. Novel adsorbent NH_2-MIL-125 could be promising for AHT owing to its high water adsorption capacity and good hydrothermal stability, although its dynamic properties have not been tested yet. In this paper the results of dynamic study of water adsorption on loose grains of NH_2-MIL-125 are presented. The adsorption dynamics is studied by a Large Temperature Jump method under typical operating conditions of isobaric stages of adsorptive cooling cycle. The effects of the adsorption/ desorption temperature, adsorbent grain size and number of the grain layers are explored. The water adsorption on the grains of 0.2 – 1.8 mm size are shown to occur under a "grain size insensitive" mode as the adsorption rate is determined by the ratio *S*/*m* of the heat transfer area to the adsorbent mass regardless the grain size. Indeed, the ad/desorpion rate and the Specific Cooling Power (SCP) are proportional to the (*S*/*m*)-ratio. Quite high SCP-values of 0.4 - 2.8 kW/kg can be obtained in adsorption chillers having a large (*S*/*m*)-ratio of 1.6 to 6.9 m^2/kg, which is of high practical interest.

Key-words: NH_2-MIL-125, water vapor, adsorption, kinetics, adsorptive cooling

Nomenclature

c_p - specific heat, J/(gK)

D – diffusivity, m^2/s

D_{gr} – grain size, mm

ΔH – enthalpy, J/g

ΔL – latent heat, J/g

h – heat transfer coefficient between the bed and the wall, W/(m^2K)