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NH_2-MIL-125 AS A PROMISING MATERIAL FOR ADSORPTIVE HEAT TRANSFORMATION AND STORAGE

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Abstract

Due to high energy saving potential Adsorption Heat Transformers (AHTs) are gaining more and more interest during last years. A large advance in the enhancement of the AHT's performance can be achieved with the development of new advanced adsorbents. We present the results of comprehensive study of equilibrium and dynamics of water adsorption on a novel adsorbent NH_2-MIL-125 and evaluation of potential of the 4"NH_2-MIL-125 – water" working pair for AHTs. NH_2-MIL-125 exchanges 0.39 g H_2O/g under typical conditions of adsorption chilling cycle which exceeds the uptake variation of common and innovative adsorbents for AHT. The isosteric heat of water adsorption varies in the range of 49.7 ± 1.0 kJ/mol to 54.8 ± 2.0 kJ/mol at uptake 0.03–0.40 g/g. The verification of NH_2-MIL-125 cycling stability demonstrates that both the adsorption capacity and porosity of NH_2-MIL-125 change slightly during the first adsorption cycle and then remain near constant. Based on the data obtained, the Coefficient of Performance and Specific Cooling Power of the adsorption chilling cycle utilizing "NH_2-MIL-125 – water" pair were assessed at regeneration temperature of 75–80 °C as 0.77–0.80 and 2.8 kJ/kg, respectively. That demonstrates its large potential for low temperature heat transformation.