IX Minsk International Seminar "Heat Pipes, Heat Pumps, Refrigerators, Power Sources",
Minsk, Belarus, 07-10 September, 2015

IN-SITU WATER UPTAKE RATE MEASUREMENT OF AQSOA FAM-Z02 PACKED IN FINNED TUBE ADSORBER BEDS OF AN ADSORPTION COOLING SYSTEM

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Abstract

Adsorption cooling systems (ACS) utilize waste heat or low-grade thermal energy to produce the cooling power required for air conditioning and refrigeration (A/C-R) in buildings and mobile applications. However, the bulkiness and heavy weight of ACS presently limit its commercialization. To minimize the footprint of ACS, different materials with high uptake rate have been developed. Thermogravimetric analysis (TGA) is a well-known techniquefor measuring the adsorbate uptake rate of an adsorbent material,. However, this method does not consider the effects of adsorber bed geometry, interparticle mass transfer resistances, and pressure drop. In a real ACS, adsorbent material is packed in an adsorber bed protected with metallic wire mesh. These geometrical constrains may limit the uptake rate of the adsorbent material. In this study, the water uptake rate of AQSOA FAM-Z02 packed in an adsorber bed was measured in-situ under the adsorption temperature of 30°Cand desorption temperature of 90°C while the water source temperature was held constant at 20°C. Two different heat exchanger designs were chosen and the water uptake rate was measured by monitoring the heat exchanger's mass in real time. The results show that the adsorber with higher surface area and 10 fins per inch (FPI) provides the specific cooling power (SCP) of as high as 110 W/kg at cycle time of 8 min and three times higher SCP than the adsorbed bed with 3 FPI under cycle time of 60 min.