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DESIGN AND DEVELOPMENT OF LOW CAPACITY TWIN BED SILICA GEL–WATER ADSORPTION REFRIGERATION SYSTEM

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Content :

A low capacity twin bed adsorption refrigeration system has been developed using silica gel as the adsorbent and water as the refrigerant. Custom vessels have been fabricated to house the adsorber beds, condenser and the evaporator. A capillary is used as an expansion device, unlike other adsorption chillers which use expansion valves. The two beds are made to operate with 180° phase difference to get continuous refrigeration throughout the cycle. The heating and cooling water temperatures are in the range of 75 °C to 85 °C and 25 °C to 30 °C, respectively. The time for one complete cycle of adsorption and desorption is varied from ~30 min to 60 min. The system is able to deliver a cooling power of ~ 280 W at the operating temperature of ~15 °C. When the experiment is performed in the mass recovery mode, the cycle time gets increased. Under this mode of operation, the COP has a value of 0.669, which is about 25 % higher than that of the cycle without mass recovery. The paper discusses the design, fabrication and experimental studies performed on this system.

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