

Study of Two Adsorbent-Refrigerant Pairs for the Application of Solar-Powered Adsorption Refrigeration System

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Abstract : This article presents a detailed study of two working pairs intended for use in solar adsorption refrigeration (SAR) system. The study was based on two indicators: the daily production and coefficient of performance (COP). The thermodynamic cycle of the system is based on the adsorption phenomena at a constant temperature. A computer simulation program has been developed for modeling and performance evaluation for the solar-powered adsorption refrigeration cycle. It was found that maximal cycled mass is obtained by S40/water (0.280kg/kg) followed by CarboTech C40/1/methanol (0.260kg/kg). At a condenser temperature of 30°C, with an adsorbent mass of 38.59 kg, and an integrated collector/bed configuration, the couple CarboTech C40/1/methanol for the ice-maker purpose can reach cycle COP of 0.63 and can produce about 13.6kg ice per day, while the couple S40/water for the air-conditioning can reach cycle COP of 0.66 and 212kg as daily cold-water production. Additionally, adequate indicators are evaluated addressing the economic and environmental associated with each working pair.

Keywords : solar adsorption, refrigeration, activated carbon, silica gel

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