Performance Study of Solar Adsorption Refrigeration System Using Activated Carbon - Methanol

The depleting of the conventional sources of energy and the excess use of HCF components lead to the need for new techniques both for conservation of energy sources for the future and for decreasing the its harmful effects on the environment. This study investigated the adsorption capabilities of activated carbon. The adsorption of methanol on this substance was tested for their application in the adsorption refrigeration system based on solar energy.

Adsorption refrigeration system has been designed and manufactured with the energy source being solar energy. Methanol/activated carbon pairs have been used in experiments. The present work focused on the performance of the adsorption refrigeration system considering the temperature attained in the evaporator and the cooled spaced cabinet. The amounts of activated carbon used was (8 kg), while the amount of methanol were (1, 1.25, and 1.5) kg. The experiments were done in different days of the year. The amount of adsorption of methanol (as a result of decreasing the evaporator and cooled spaced temperature) was found to depend on the generator pressure and its increase as the primary generator pressure decreases. The best mass of methanol used was (1 kg) which give the lowest temperature obtained at the evaporative surface was (3.4 ^{o}C) at the day (4/4/2017). The results shown that even in cloudy days there is a benefit from using such a system because the temperature attained is enough to start the adsorption process. The lowest temperature obtained at the evaporative surface was (3.4 ^{o}C) at the day (4/4/2017) for methanol mass of (1 kg) at an opening time of the valve between the evaporator and the generator (9:30am). The increase of methanol amount used in the experiment led to a good decrease in temperature attained in cooled spaced, but this is related to the time of connecting the evaporator and generator.