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Effect of Key Parameters on Performances of an Adsorption Solar Cooling Machine

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Abstract : Solid adsorption cooling machines have been extensively studied recently. They constitute very attractive solutions recover important amount of industrial waste heat medium temperature and to use renewable energy sources such as solar energy. The development of the technology of these machines can be carried out by experimental studies and by mathematical modelisation. This last method allows saving time and money because it is suppler to use to simulate the variation of different parameters. The adsorption cooling machines consist essentially of an evaporator, a condenser and a reactor (object of this work) containing a porous medium, which is in our case the activated carbon reacting by adsorption with ammoniac. The principle can be described as follows: When the adsorbent (at temperature T) is in exclusive contact with vapour of adsorbate (at pressure P), an amount of adsorbate is trapped inside the micro-pores in an almost liquid state. This adsorbed mass m, is a function of T and P according to a divariant equilibrium m=f (T,P). Moreover, at constant pressure, m decreases as T increases, and at constant adsorbed mass P increases with T. This makes it possible to imagine an ideal refrigerating cycle consisting of a period of heating/desorption/condensation followed by a period of cooling/adsorption/evaporation. Effect of key parameters on the machine performances are analysed and discussed.

Keywords : activated carbon-ammoniac pair, effect of key parameters, numerical modeling, solar cooling machine
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