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Solar sorption cooling systems

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Global growth of the commercial and residential sector is due to the rapid increase in population and economic activity. Extensive use of air-conditioning systems nowadays has significant impact on total electrical energy consumption, especially in hot climate zones. This increases the problem of CO2 emission, global warming and ozone depletions. The International Energy Agency (IEA) reported that World demand for electricity grows by 2.8% annually. TheInternational Institute of Refrigeration has estimated that air-conditioning systems are responsible for 45% of the total energy consumption for residential and commercial buildings,and most of this demand is met by conventional vapor compression refrigeration systems. This fact has led the researchers to consider the renewable energy resources, such as solar energy, to energize air-conditioning systems instead of electrical energy. Solar air-conditioning and refrigeration can be applied by a combination of solar collectors and sorption systems: the former is used to collect solar radiation and transform energy into usable heat, while the latter is utilized to convert this heat into useful refrigeration effect. The objective of this paper is to present the overall review of solar sorption technologies comprising solar absorption air-conditioning and solar adsorption air-conditioning and to identify their advantages and disadvantages. Detailed survey of the basic principles and applications of both absorption and adsorption systems is presented. The major benefit of these technologies is that they are environmentally friendly, and contribute to a significant decrease of the CO2 emissions, which cause the green house effect. In addition, their potential of primary energy savings is quite considerable. Nevertheless, solar sorption air-conditioning systems are not yet commercially competitive with conventional compression system due to the common problem associated with high investment costs.Therefore, further studies need to be carried out on the existing solar sorption systems either to enhance the heat, mass transfer of working fluids to decrease the chillers size, or to improve efficiency of solar collectors in order to reduce their required specific area.

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