

Abstract

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Augmentation of thermal efficiency of the glass evacuated solar tube collector with coaxial heat pipe with different refrigerants and filling ratio

Modified coaxial heat pipes have been designed and manufactured to improve the thermal performance of the glass evacuated solar collectors. Heat pipes were made up of two concentric copper tubes so that the annulus volume space between the concentric tubes was charged with refrigerant. In addition, the air as the working fluid at four different mass flow rates 0.0051, 0.0062, 0.007 and 0.009 kg/s flows through the inner tube of the heat pipe to the flow through the annulus between the heat pipe and glass evacuated solar tubes. The effect of the tilt angle of the evacuated tube on thermal performance of the evacuated solar tube collector was examined to obtain the optimum tilt angle during the experiments period. The influence of filling ratio for the two types of refrigerant R22 and R 134a on the thermal efficiency of the coaxial heat pipe solar collector at filling ratio range from 30% to 60% was conducted experimentally. Results show that the maximum increased in the thermal efficiency reached 67% corresponding to without heat pipes at mass flow rate 0.009 kg/s. The experiment results showed similarity between the two refrigerants.