

Comparative Performance Evaluation of a Two Compartments / Chambers Box Type Solar Cooker with Different Inner Coating

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Abstract:

The design, construction and experimental measures on a two compartments box-type solar cooker were discussed in this paper. Materials such as ply wood, 2 by 2 cm noggin wood, nails, harmer, aluminium sheet, mirror, organic cotton, top gum and the measuring devices were used and employed to evaluate the performance of the cooker. The two chambers are of equal dimensions 84 cm by 38 cm internally. The solar cooker was experimented by conducting a stagnation and a load test to investigate its performance. Chamber with all its inner surfaces coated black recorded its highest stagnation temperature of 135.5°C within 20 minutes. While chamber with reflecting walls and black coated floor recorded its highest stagnation temperature of 129.4°C within 80 minutes. The rating power and efficiency of each chamber were calculated to be 265.113 W & 48.46% (chamber with black inner coating) and 228.137 W & 40.81% (chamber with reflecting walls and black coated floor) respectively. Figures of merit were also deduced for each as $F_1 = 0.062$ & 0.069 , while $F_2 = 0.1707$ & 0.1628 respectively for chamber with black inner surfaces and a chamber with reflecting walls and black coated floor. The geometric concentration ratio of the solar box cooker by calculation is 7.69.

Keywords:

Two compartments, performance, stagnation temperature, coated floor, figures of merit and concentration ratio.