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Double slope solar distiller with nanoparticles coated wick materials

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Abstract

Experimental research is done on a revolutionary double slope wick type solar distiller (DSWSD) covered with lanthanum cobalt oxide ($LaCoO_3$) nanoparticles doped in black paint. The jute wick surface is evenly speared with nano $LaCoO_3$/black paint to increase solar irradiance absorption and facilitate successful desalination. At low saline water flow rates for the DSWSD, it is seen that there is an increase in internal HTCs as well as distilled yield. At a saline water flow rate of 0.05 kg/min, the suggested 5.40 and 3.85 kg/m^2 per day, respectively.

Introduction

The core topic of this study, enhancing solar distillers by employing nanoparticles to boost freshwater production, has been the focus of numerous other studies. CuO nanoparticles were employed by Sahota and Tiwari [1] to enhance the passive solar distiller system. In comparison to the conventional distiller, it was calculated that the generated water from one using CuO nanofluids was improved by about 37.78%. Classic solar distiller was studied by Elango et al. [2] using three modified nanoparticles (ZnO, Al_2O_3, SnO_2). In comparison to solar distillers with the other two nanoparticles and solar stills without nanoparticles, the Al_2O_3 nanoparticle-containing solar distiller had the best water production[3]. Al_2O_3 nanoparticles' outstanding thermal characteristics allowed for a water production increase of around 29.95% in comparison to a solar still without nanoparticles, whereas ZnO and SnO_2 saw yield increases of about 18.63% and 12.2%, respectively. Graphite-CuO micro-flakes were used to examine the performance of the solar still [4]

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Fig. 1. photographic view

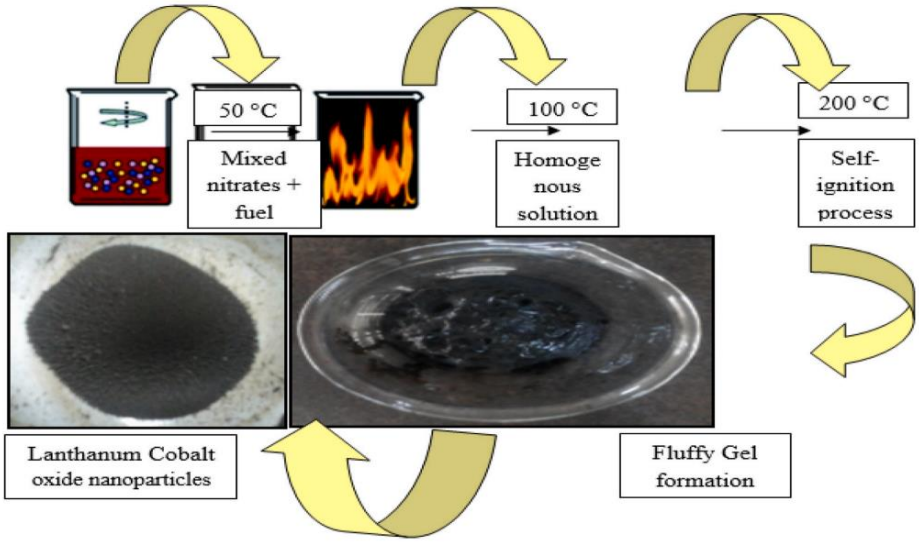

Fig. 2. Sol-gel self-ignition reaction.

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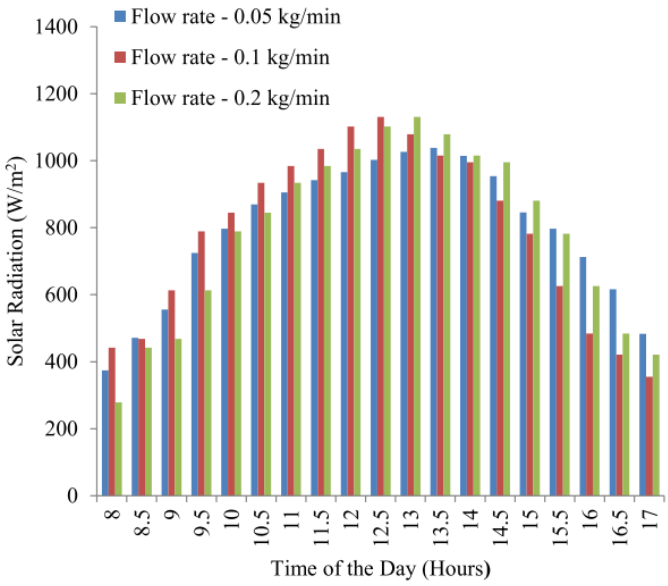

Fig-3. Solar Radiation

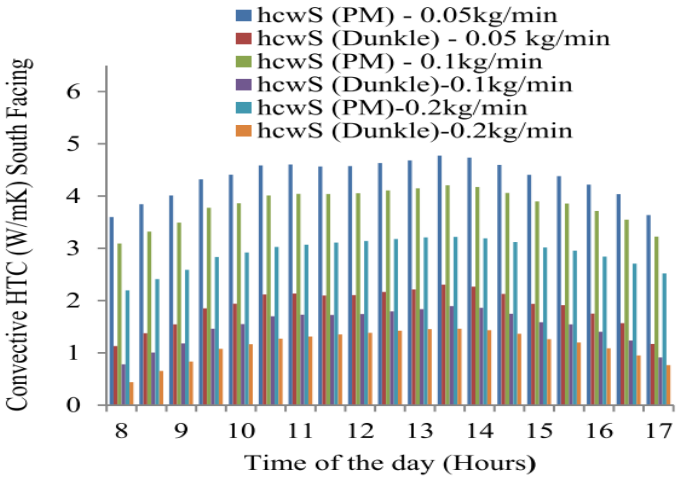

Fig-4 Convective, and evaporative HTCs

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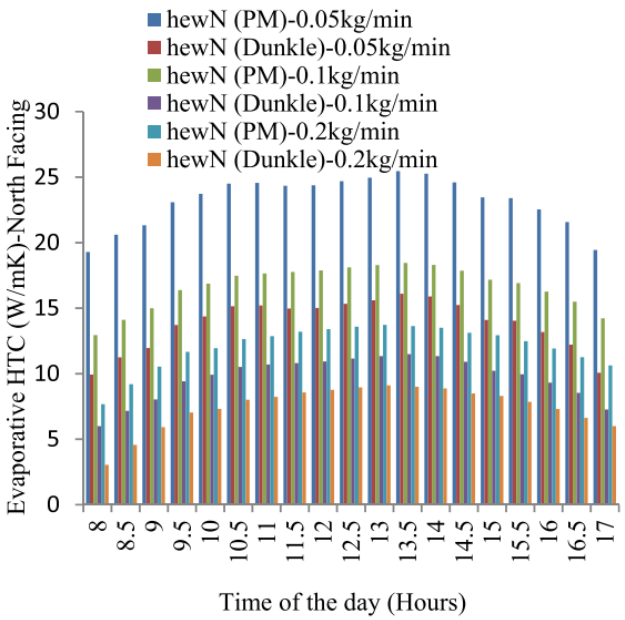

Fig.5 Saline water mass flow rate

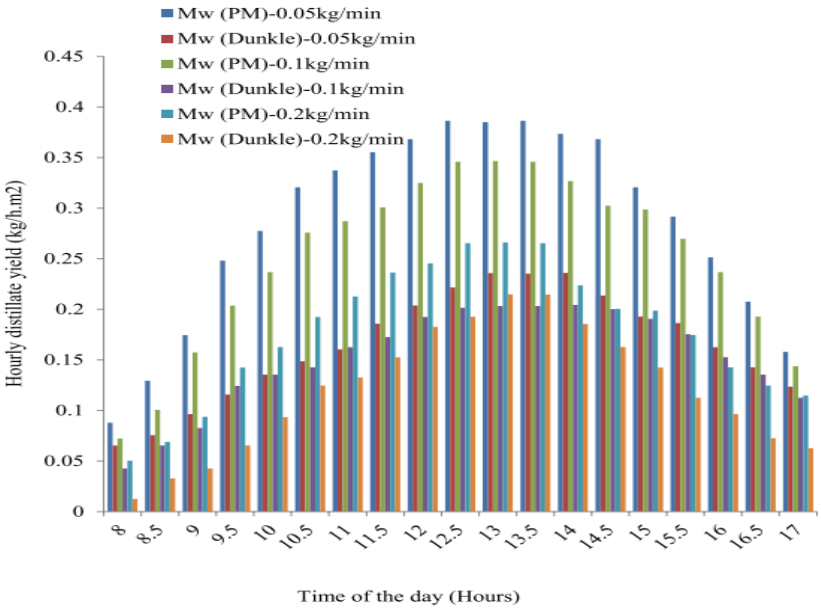

Fig.6 Changes in hourly productivity

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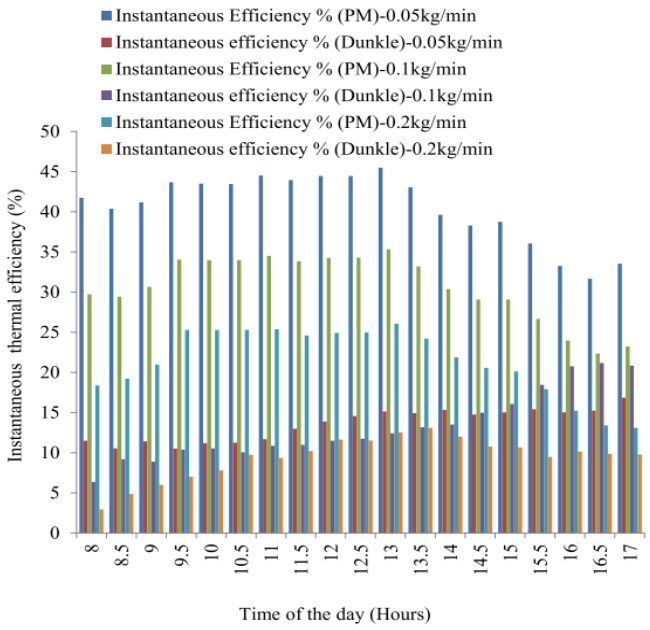

Fig 7. Efficiency values

Conclusion

The current study was conducted in the climatic circumstances of the Guntur District, Andhra Pradesh, India, using a novel double slope basin wicks type solar distiller. First, an effective sol-gel self-ignition approach for the manufacture of $LaCoO_3$ nanoparticles was reported. SEM and XRD were used to characterize the $LaCoO_3$ nanoparticles in order to assess their long-term performance.

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