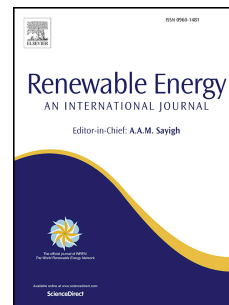


Accepted Manuscript

Melting enhancement of a latent heat storage with dispersed Cu, CuO and Al₂O₃ nanoparticles for solar thermal application

Dawit Gudeta Gunjo, Smruti Ranjan Jena, Pinakeswar Mahanta, P.S. Robi



PII: S0960-1481(18)30013-2

DOI: [10.1016/j.renene.2018.01.013](https://doi.org/10.1016/j.renene.2018.01.013)

Reference: RENE 9618

To appear in: *Renewable Energy*

Received Date: 29 July 2017

Revised Date: 31 December 2017

Accepted Date: 4 January 2018

Please cite this article as: Gunjo DG, Jena SR, Mahanta P, Robi PS, Melting enhancement of a latent heat storage with dispersed Cu, CuO and Al₂O₃ nanoparticles for solar thermal application, *Renewable Energy* (2018), doi: 10.1016/j.renene.2018.01.013.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Melting Enhancement of a Latent Heat Storage with Dispersed Cu, CuO and Al₂O₃ Nanoparticles for Solar Thermal Application

Dawit Gudeta Gunjo¹, Smruti Ranjan Jena¹, Pinakeswar Mahanta¹, P.S Robi^{1*}

*corresponding author: email: psr@iitg.ernet.in

Phone: +91(361) 2582668

Fax: +91(361) 2690762

¹*Department of mechanical engineering, Indian Institute of Technology Guwahati, Guwahati, 781039, Assam, India*

Abstract

The performance of all latent heat storage system depends on the quality of phase change material used. In the present study, paraffin-based nanofluid dispersed with 5% of Cu, 5% of CuO and 5% of Al₂O₃ nanoparticles are used to investigate its effect on the storage characteristics. A 3-D numerical model of a shell and tube regenerative type latent heat storage is developed using COMSOL Multiphysics 4.3a to predict the average temperature and melt fraction of paraffin-based nanofluid. The validation with the established pieces of literature and experiments indicated a sound agreement. The effect of adding nanoparticles on melting/solidification rate and energy storing/ releasing rate are also studied. The result revealed that addition of 5% of Cu, 5% of Al₂O₃ and 5% of CuO nanoparticles improved the melting rate by 10 times, 3.46 times and 2.25 times and the discharged rate by 8 times, 3 times and 1.7 times, respectively compared to the pure paraffin filled latent heat storage system. However, it decreased the specific heat and heat of fusion which reduced the sensible and latent heat storing capacity. Additionally, orientations of cylinder and tube arrangement are also studied numerically using paraffin as phase change material.

Keywords: Paraffin; Nanofluid; Average temperature; Melt fraction; Solidification

Download English Version:

<https://daneshyari.com/en/article/6764883>

Download Persian Version:

<https://daneshyari.com/article/6764883>

[Daneshyari.com](https://daneshyari.com)