

## INVESTIGATIONS ON PHASE CHANGE MATERIALS FOR ENHANCEMENT OF THERMAL CONDUCTIVITY

by

**Emeema JANUMALA<sup>a</sup>, Murali GOVINDARAJAN<sup>a\*</sup>,  
Venkateswara Reddi BOMMA REDDI<sup>b</sup>, and Sivakandhan CHINNASAMY<sup>c</sup>**

<sup>a</sup>Department of Mechanical Engineering, Koneru Lakshmaiah Education Foundation,  
Vaddeswaram, Guntur, Andhra Pradesh, India

<sup>b</sup>Department of Mechanical Engineering, Vidya Jyothi Institute of Technology,  
Hyderabad, Telangana, India

<sup>c</sup>Department of Mechanical Engineering,  
Nadar Saraswathi College of Engineering and Technology, Theni, Tamilnadu, India

Original scientific paper  
<https://doi.org/10.2298/TSCI201113219J>

*Experimental work has been undertaken to improve the thermal conductivity of the phase change material (PCM), paraffin wax (PW) by adding  $Al_2O_3$  and Cu particles in increased mass fractions to elevate thermal energy storage efficiency. Composite PCM of PW- $Al_2O_3$  and PW-Cu with 5%, 10%, and 15% mass fractions were prepared by sonication. Morphology of micro-structures of PW and composite PCM were examined using SEM. Thermophysical properties were measured using standard testing methods. Latent heat and specific heat were recorded with differential scanning calorimeter. Thermal conductivity was tested using two slab guarded hot plate apparatus. The results showed an improvement in thermal conductivity and latent heat of the composite PCM. The enhancement ratio of thermal conductivity was 10% and 80% for PW- $Al_2O_3$  and PW-Cu composite PCM respectively at 15 wt.%.*

**Key words:**  $Al_2O_3$ , composite PCM, Cu, mass fraction, PW, PCM, thermal conductivity

### Introduction

The growing global demand for energy is phenomenal and needs to be urgently addressed. Depletion of fossil fuels and their harmful effect on the environment creates the necessity to explore RES like solar energy which is abundantly available in nature. But the intermittent nature of its availability calls for storage of energy [1]. The technology used for storing thermal energy is garnering immense attention in contemporary times because of its potential for widespread application. Storage of thermal energy can be in the form of sensible, latent and thermo-chemical heat. Latent heat storage (LHS) technique utilizing PCM is very popular and widely used because of the superior characteristics exhibited [2].

\*Corresponding author, e-mail: [drmurali@kluniversity.in](mailto:drmurali@kluniversity.in)



*Hari*  
**Dr. C. MATHALAI SUNDARAM, M.E., M.B.A., Ph.D.,**  
**Principal**  
**Nadar Saraswathi College of**  
**Engineering and Technology**  
**Vadapudupatti, Theni-625 531.**