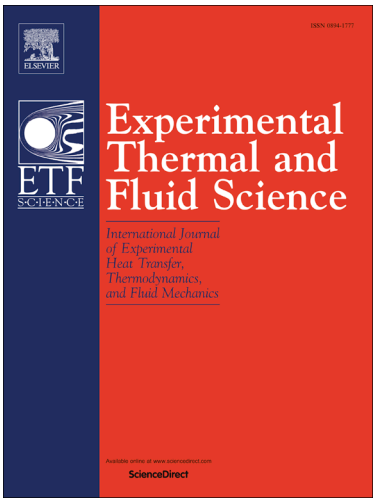


# Experimental investigation of melting behaviour of phase change material in finned rectangular enclosures under different inclination angles

Babak Kamkari, Dominic Groulx

PII: S0894-1777(18)30541-7
DOI: https://doi.org/10.1016/j.expthermflusci.2018.04.007
Reference: ETF 9442

To appear in: *Experimental Thermal and Fluid Science*

Received Date: 11 December 2017
Revised Date: 19 March 2018
Accepted Date: 8 April 2018

Please cite this article as: B. Kamkari, D. Groulx, Experimental investigation of melting behaviour of phase change material in finned rectangular enclosures under different inclination angles, *Experimental Thermal and Fluid Science* (2018), doi: https://doi.org/10.1016/j.expthermflusci.2018.04.007

# Experimental investigation of melting behaviour of phase change material in finned rectangular enclosures under different inclination angles

**Babak Kamkari[a,*], Dominic Groulx[b]**

[a] Department of Mechanical Engineering, Yadegar -e- Imam Khomeini (RAH) Shahre-Rey Branch, Islamic Azad University, Tehran, Iran

[b] Department of Mechanical Engineering, Dalhousie University, Halifax, Nova Scotia, B3H 4R2, Canada

**Abstract**:

The deployment of phase change materials (PCMs) in practical applications is in large part limited by the low thermal conductivity of the available PCMs. Hence, in this study, enhancement in the melting rate of PCM by addition of fins in rectangular enclosures was experimentally investigated under different inclination angles. The melting process of lauric acid in side-heated enclosures with different numbers of fins was evaluated for inclination angles of $90^o$ (vertical), $45^o$ and $0^o$ (horizontal). In order to visualize the melting process, the enclosure was fabricated from transparent acrylic material except one side made of an aluminum plate to heat the enclosure isothermally. Solid-liquid interface positions and temperature history of the PCM were recorded and applied to calculate the liquid fractions and heat transfer rates. The evolution of the interface in the inclined enclosures revealed that the development of vortical flow structures in the liquid PCM by decreasing the inclination angle significantly improves the melting rate. It was found that for both finned and unfinned enclosures the melting rate increases by reducing the inclination angle. Heat transfer enhancements obtained by the 0-fin horizontal and 3-fin vertical enclosures compared to the 0-fin vertical enclosure were 115% and 56%, respectively. This thermal behavior proposes that simply inclining the enclosure can be more effective to enhance the melting rate than

*Corresponding author, Tel.: +989124034778
E-mail address: kamkari@ut.ac.ir (Babak Kamkari)