# This study focuses on melting of nano-enhanced phase change materials

# Numerical investigation of melting of nanoparticle-enhanced phase change materials

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Latent heat thermal energy storage using a phase change material (PCM) is one of the most promising techniques for many industrial applications such as thermal storage of solar energy, thermal storage in buildings, cooling of engines and thermal management of electronic devices due to its high energy storage density and nearly constant temperature during melting and solidification [1]. However, the main limitation of PCMs is low conductivity which causes low rates of heat transfer during solidification and particularly melting processes. One of the ways to overcome this drawback is to disperse nanoparticles with high thermal conductivity into PCM which results in significant increase in effective thermal conductivity and enhances heat transfer characteristics [2].

In this study, melting process of paraffin wax dispersed with CuO in an enclosure is investigated numerically. The effect of volumetric concentration of nanoparticle on the melting process is investigated. In the computations, thermophysical properties are considered to be temperature dependent. Melt fraction and melting front are compared at various times for different volume fractions of CuO. The results showed that dispersing nanoparticles increases heat transfer rate hence decreases melting time. However, dispersing CuO nanoparticles with volume fraction decreases heat transfer rate compared to the case with the low volume fraction one.

**1.** *Zalba B., Marin J.M., Cabeza L.F., Mehling H.* Review on thermal energy storage with phase change: materials, heat transfer analysis and applications //Appl Therm Eng. – 2003, **-23**, -P. 251-283
**2.** *Khodadadi J.M., Hosseinizadeh, S.F.* Nanoparticle-enhanced phase change materials (NEPCM) with great potential for

improved thermal energy storage // Int Commun Heat Mass.– 2007. **-34**, -P. 534–543.