Contemporary NePCMs: Classification and Applications in Thermal Energy Management Systems

Abdullah Aziz¹, Waqas Waheed¹, Abed Mourad², Abderrahmane Aissa², Obai Younis³, Eiyad Abu-Nada¹, and Anas Alazzam¹

¹Khalifa University
²Mustapha Stambouli Mascara University
³Prince Sattam bin Abdulaziz University

July 4, 2023

Abstract

Nano-Enhanced Phase Change Material (NePCM) is a promising technology aimed at reducing global energy consumption by maximizing the thermal capacity and minimizing heat loss of traditional phase change materials (PCMs). The superior heat capacities, thermal conductivities, and stability of NePCMs have been the subject of extensive research, and this review aims to classify recently investigated NePCMs based on their components and melting temperatures. By providing a comprehensive classification of NePCMs reported in the literature, considering their melting temperature and composition, this review offers a deeper understanding of these materials. Furthermore, the review delves into the various applications of NePCM in thermal management systems (TMS) and describes current methods for improving their performance by modifying geometric parameters and configurations. Additionally, a new classification is introduced for NePCMs that do not fit directly into existing PCM categories, and a stack bar chart is created to cross-reference this classification with temperature and composition. The review also identifies gaps in the literature and suggests areas for future research, providing a valuable resource for those interested in this field.

Hosted file