UAEU جامعة الإمارات العربية المتحدة United Arab Emirates University

The College of Graduate Studies and the College of Engineering Cordially Invite You to a

PhD Dissertation Defense

Entitled

UTILIZATION OF TRIPLY PERIODIC MINIMAL SURFACE (TPMS) BASED ARCHITECTURES IMPREGNATED WITH PHASE CHANGE MATERIAL FOR HEAT TRANSFER APPLICATIONS

By

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Date & Venue

8:00 – 10:00 am

2nd February

F1 Building Room 1043

https://teams.microsoft.com/l/meetup-join/19%3ameeting_NjI0MjA2MjUtZDgyYi00MWE3LTllMGYtYmIyZjAwMDk4N2Vk%40thread.v2/0?context=%7b%22Tid%22%3a%2297a92b04-4c87-4341-9b08-d8051ef8dce2%22%2c%22Oid%22%3a%226e23204b-e131-42ec-8a13-317fa505e58b%22%7d

Abstract

This dissertation is concerned with the utilization of mathematically architected Triply Periodic Minimal Surface (TPMS) based lattices for Latent Heat Thermal Energy Storage (LHTES) systems. With the advent of Additive Manufacturing (AM), TPMS structures can be readily manufactured. The objective of this dissertation was to investigate the heat transfer performance of TPMS structures vis-à-vis conventional metal foams represented by Kelvin cell while both were impregnated with a Phase Change Material (PCM). Numerical simulations were performed under various boundary conditions to assess the performance. It was found that TPMS structures outperformed the conventional metal foam. Moreover, the effects of boundary conditions (isothermal and isoflux), configuration (sheet and solid TPMS), porosity, and functional grading on the performance of TPMS structures were studied. This dissertation reported the utilization of TPMS structures for LHTES systems for the first time in the literature. The superiority of TPMS structures make them potential candidates for utilization in various applications related to LHTES.

Keywords: Architected Lattices, Latent Heat Thermal Energy Storage (LHTES), Metal Foam, Phase Change Material (PCM), Triply Periodic Minimal Surface (TPMS)