

عنوان مقاله:

Heat Transfer Enhancement in a Gyroid Triply Periodic Minimal Surface Heat Exchanger: A Numerical Approach

محل انتشار:

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نویسندگان:

Ahmad Nazari Gazik - *Department of Mechanical Engineering, Ferdowsi University of Mashhad, Mashhad, Iran*

Mohammad Saeed Qomi - *Department of Mechanical Engineering, Ferdowsi University of Mashhad, Mashhad, Iran*

Mohammad Passandideh-Fard - *Micro/Nanofluidics Laboratory (MNL), Department of Mechanical Engineering Ferdowsi University of Mashhad, Mashhad, Iran*

خلاصه مقاله:

Heat exchangers are key components for heat transfer in many devices with a wide range of applications. Optimizing the efficiency of heat exchangers can increase the efficiency of system and also help global energy consumption. Due to the higher surface to volume ratio, heat transfer in compact heat exchangers exceeds conventional plate heat exchangers. This study considers a novel compact heat exchanger based on Gyroid Triply Periodic Minimal Surface (TPMS). TPMS structures are a type of differential surfaces that have a wide variety of applications, especially in Biomechanics, Biomaterials and heat transfer. This paper focuses on a numerical approach using Ansys ۲۰۲۲ commercial software to simulate the fluid flow and heat transfer in a Gyroid TPMS structure heat exchanger. Both hot and cold fluids were assumed water with a ۱۰ mm/s inlet velocity magnitude in a ۱۰۰×۴۰×۲۰mm heat exchanger with a wall thickness of ۰.۵mm. The results demonstrated that the temperature change between the inlet and outlet of the fluids in the considered Gyroid TPMS heat exchanger is far higher than conventional plate heat exchangers, witnessing a ۸۸% and ۱۶۰% increase for in two configurations of parallel and counter flow, respectively. Pressure drop in the considered heat exchanger is considerably higher.

کلمات کلیدی:

Compact Heat Exchanger, Gyroid, TPMS, Numerical Modeling, Fluid Flow, Heat Transfer

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