

عنوان مقاله:

Cellular Latticed Compact Heat Exchanger - New Design to Enhance Thermo-Hydraulic Performance

محل انتشار:

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خلاصه مقاله:

In this study, a three-dimensional CFD numerical simulation is successfully carried out in order to clarify the thermo-hydraulic characteristics of a novel trussed fin-and-elliptical tube heat exchanger (FETHX) with high-porosity periodic cellular lattice (PCL) structures, namely - simple cubic (SC), body-centered cubic (BCC), reinforced body-centered cubic with vertical ligaments (BCCZ), face-centered cubic (FCC) and reinforced face-centered cubic with vertical ligaments (FCCZ). Investigating the influence of morphological parameters, such as lattice structure topology and porosity on the thermo-hydraulic performance (THP) has been led to a deeper understanding of the superior heat transfer enhancement ability of the PCL structure is chiefly due to the noticeably increased heat transfer surface area density, and the interactions between the flow and cellular lattice core effects generating strong secondary vortices. The results are analyzed from the viewpoint of the THP benchmarks analysis such as field synergy performance and performance evaluation criterion. The computational outcomes demonstrate that the high-porosity of all PCL structures decrease to ۹۲% provides the best THP. Overall, according to the obtained outcomes, the trussed FETHX with the advantages of using BCCZ lattice structure at ۹۲% porosity presents good THP enhancement among all the investigated PCL structures.

کلمات کلیدی:

periodic lattice structures, cellular materials, finned tube heat exchanger, field synergy principle, goodness factors

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