عنوان مقاله:

Study of flow and heat transfer characteristics in a periodic zigzag channel for cooling of polymer electrolyte fuel cells

محل انتشار:

تعداد صفحات اصل مقاله: 20

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خلاصه مقاله:

In this study, a periodic zigzag channel with rectangular cross-section has been used in order to obtain a high-efficiency system for cooling a polymer electrolyte fuel cell. An appropriate function of fuel cells and enhancement of their lifetime require uniform temperature conditions of around 80°C. On the other hand, due to volume and weight constraints, a low-density compact heat exchanger is required, where the coolant fluid is water and the flow regime is laminar with a Reynolds number of 200. In order to consider these problems and increase the heat transfer rate under these conditions, a three-dimensional periodic zigzag channel is employed and the results are compared with the results which have been obtained for the straight channel. The results indicate that the zigzag channel generates chaotic advection and provides a good mixture of the hot fluid adjacent to the wall and the cool fluid away from it. This leads to a uniform temperature distribution along the channel. In addition, the values of Nusselt number and friction coefficient show that average Nusselt number in the zigzag channel is 6.5 times larger than that in the straight channel while the pressure drop remains approximately constant.

کلمات کلیدی:

PEM fuel cell, Heat Transfer, Chaotic Advection, Zigzag Channel

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